

# On the Classification of Actiniaria.

Part III.—Definitions connected with the forms dealt with in  
Part II.

By

**T. A. Stephenson, M.Sc.**

University College of Wales, Aberystwyth.

## CONTENTS.

	PAGE
1. DEFINITIONS . . . . .	247
2. APPENDIX . . . . .	306
3. LIST OF LITERATURE . . . . .	311
4. INDEX TO GENERA DEALT WITH IN PARTS II AND III . . . . .	316

### 1. DEFINITIONS.

N.B.—In the following pages only a necessary minimum of synonymy is given : species-lists are not necessarily exhaustive ; and dubious forms are often omitted. Except where stated explicitly, all reasons for the classification here used will be found in Parts I and II.

Sub-class ZOANTHACTINIARIA. Van Bened.

(As used by Bourne, 1916, pp. 514-15 = DODECACORALLIA.  
Carlgr., Brom's 'Thierreich', 1908.)

Order DODECACTINIARIA.

(As used by Bourne, 1916, p. 515.)

Sub-order ACTINIARIA.

Tribe 1. PROTANTHEAE. Carlgr.

Founded by Carlgren in 1891 : used here in its original and narrow sense, as covering Gonaetinia and Protanthea

(and probably *Oractis*) only, not in the wider sense of Carlgrén's later work.

Actinaria with or without a definite base, but without basilar muscles. The body is smooth. There is a sheet of longitudinal muscle-fibres in the ectoderm of body-wall and actinopharynx as well as of disc and tentacles, and the body-wall ectoderm at least has also spirocysts. Sphincter absent or weak diffuse endodermal. Tentacles few or more numerous, simple. In normal animals only eight mesenteries are perfect, and these are the analogues of the eight macrocnemes of *Edwardsia*. The mesenterial muscle is weak, often hardly more developed than the body-wall muscle, and not forming a very definite retractor usually. The number of mesenteries present beyond the eight protoenemes varies, but the eight are not sharply marked off from the others as macrocnemes, although they have a certain predominance, especially in *Oractis*. Four imperfect mesenteries pair with the lateral protoenemes, and the rest form a secondary cycle or cycles. The distribution of gonad and filament may affect the protoenemes only (*Oractis*), or the protoenemes and their lateral partners (*Gonaetinia*), or the whole of cycle 2 as well (*Protanthea*). The filaments have no ciliated tracts. There are no well-marked siphonoglyphes.

#### Family 1. GONACTINIIDAE. Carlgr., 1893.

Used here *sensu stricto* for *Gonaetinia*, *Protanthea*, and *Oractis* only.

With the characters of the tribe *Protantheae*.

#### GONACTINIA, Sars, 1851, p. 142.

*Gonaetiniidae* with the gonads confined to the lateral protoenemes normally, whereas the filaments are found not only on these but also on their partners and on the directives. There is a definite base. Reproduction often asexual.

Species :

*G. prolifera*, Sars, 1835, p. 3. (See Carlgrén, 1893, p. 31.)

#### PROTANTHEA, Carlgr., 1891.

*Gonaetiniidae* with gonads and filaments on the mesenteries of cycles 1 and 2, and beyond these cycles small mesenteries devoid of appendages and confined to the uppermost parts of the body. There is a definite base.

Species :

*P. simplex*, Carlgr., 1891, p. 81; 1893 p. 24.

ORACTIS, McM., 1893, p. 138.

Gonactiniidae (?) in which only the eight protoconemes are fertile and filamented. There is no definite base, and there are only ten tentacles.

Species :

*O. diomedaeae*, McM., 1893, p. 138.

This genus is not yet very fully known, but is probably referable to this family.

## Tribe 2. PTYCHODACTEAE, *n. sp.*

Containing the family Ptychodactidae only.

Actiniaria with a definite base, which may rather merge into the column, but without basilar muscles. Body-wall smooth or with vertical rows of hollow outgrowths; in structure, however, similar to the tentacles, with ectodermal muscle-sheet and at least usually spirocytes. Sphincter absent or weak diffuse endodermal. Tentacles few or more numerous, simple. Actinopharynx either quite rudimentary and reduced to a narrow band, or else quite well developed and provided with siphonoglyphs and ectodermal muscle-fibres. Six to twelve or more pairs of mesenteries perfect. Musculature of mesenteries weak, hardly forming retractors. The free borders of the mesenteries (or their representatives if the mesenteries fuse below) are occupied by filament above and gonad below, not both together. The filaments have no ciliated tracts, but those of the imperfect mesenteries end up above in a curious structure like a bisected funnel, unusual in form and make-up.

### Family 1. PTYCHODACTIDAE, Appellöf, 1893.

See also Carlgren, 1911, p. 12, &c.

With the characters of the tribe Ptychodacteae.

Genera : *Ptychodactis*, *Dactylanthus*

*PTYCHODACTIS*, Appellöf, 1893, p. 4.

Ptychodactidae with about 100 tentacles or more. Smooth body. No sphincter. Actinopharynx rudimentary, reduced to a narrow band just inside the lip, which is produced at certain points into lappets for the attachment of larger mesenteries. Mesenteries irregularly arranged: primaries and usually secondaries perfect.

Species :

*P. patula*, Appellöf, 1893, p. 4. (See also Carlgren, 1911.)

## DACTYLANTHUS, Carlgr., 1911, p. 2.

Ptychodactidae with twenty-four tentacles. Body with twenty-four vertical rows of hollow outgrowths or vesicles, corresponding to the twenty-four regular endocoels and exocoels. Sphincter very weak diffuse. Actinopharynx quite well developed, with two siphonoglyphes and with curious pockets between the insertions of some of the mesenteries. Twelve pairs of mesenteries, six pairs or all of them perfect, all fusing together down below in the gonad region, in such a way that the gonads occupy no longer the now non-existent free edge of the mesentery, but the region nearest to the point of fusion.

Species :

*D. antarcticus*, Clubb, 1908, p. 5. (See Carlgren, 1911.)

## Tribe 3. NYNANTHEAE, Carlgr.

Used here in a different sense than that of Carlgren, so that it excludes Edwardsiaria, Corallimorphidae, and Discosomidae, but includes Boloceroides and the Endocoelactids.

Actiniaria with or without a definite base, with or without basilar muscles. Body-wall smooth or with verrucae or outgrowths of one sort or another. The presence of a sheet of ectodermal muscle in body-wall or actinopharynx is exceptional, occurring sporadically, and sometimes reduced to a vestige such as ectodermal muscle in the siphonoglyphes. Spirocysts in body-wall ectoderm are also exceptional save in Endocoelactaria. A sphincter may or may not be present, and if present may be weak or strong, endodermal or mesogloal. Tentacles few or many, simple or complex, their longitudinal musculature ectodermal or mesogloal. Siphonoglyphes are typically present. The mesenterial filaments have ciliated tracts. Pairs of perfect mesenteries are present save in abnormal cases, and usually at least six pairs, often more. Six is a fundamental number for arrangement of parts, but there are a good many deviations. Mesenterial musculature does not often exhibit so low a grade as in Gonactiniidae, Ptychodactidae, and many Madreporaria—often it is highly developed, very definitely marked off retractors being formed—cases of weakness are usually sporadic and secondary rather than universal and inherent.

## Sub-tribe 1. ATHENARIA, Carlgr.

Used here as covering Haleampids and Hyanthids but not Edwardsians.

Nynantheae representing those forms which being the outcome of a Haleampa-like ancestor have retained more similarity to that



ancestor than most forms, and live a more or less burrowing life. Size variable, predominating shape vermiform, this being attained in greater or less degree in different cases; the diameter of the body in some forms, or at least in some states, bearing a fair proportion to its length. There is no adherent base, the aboral end being a physa, which does sometimes adhere to small objects. There is little or no sphincter, but if present it may be endodermal or mesogloal. Cincelides often present. Number of tentacles usually small, even at greatest not passing about forty; not more than one communicates with each endocoel and exocoel. Number of mesenteries similarly limited, and they are either all macrocnemes or else a division into macro- and microcnemes is to be found—with an intermediate condition in the case of *Peachia*. Secondary mesenteries develop in the exocoels of the primaries. Sometimes the larvae seem to be parasitic on medusae.

#### Family 1. HALCAMPIDAE, Andres.

Used here in the general sense of Andres, 1883, p. 312.

Hyanthidae as used by Gosse, *pro parte*.

Including Halcampoidinae, Appellöf, 1896, p. 13; Halcampomorphinae, Carlgr., 1893, p. 38; Halcampinae, Carlgr., 1893, p. 38; Monaulidae, Hertw., 1882, p. 104; Halianthinae, Kwiet., 1896; and 'Fenja' and 'Aegir'.

Athenaria of more or less vermiform shape, with or without suckers or papillae on the body, with or without cuticle or incrustation. Cincelides may occur in the physa. Tentacles eight to twelve, fourteen, twenty, or more, and with other variations, their longitudinal musculature ectodermal. Sphincter absent, weak mesogloal, or weak endodermal. The mesenteries have as their main feature six pairs of macrocnemes, but there are variations; the full six pairs may not be developed, or there may be one or two unpaired macrocnemes in addition to them. Microcnemes are sometimes present, their number varying.

Genera: *Halcampa*, *Halcampoides*, *Pentactinia*, *Scytophorus*.

*HALCAMP*A, Gosse, 1858.

See Carlgren, 1893, pp. 37-8; Kwietniewski, 1896, p. 585; Haddon, 1889, p. 335; Carlgren, 1900 (on *Pentactinia*), p. 1170, &c.; and Stephenson, 1918 A, pp. 8-10. *Halianthus*, Kwiet. *Halianthella*, Kwiet. ? *Halcampella*, Andres.

Halcampidae typically worm-like, more or less, but very changeable in form (see Part II, Text-fig. 7, c, d). There is a physa which may or may not be retractile and which has cinclides in it (always?). The main part of the body, or scapus, may be without suckers, or it may have suckers to which sand adheres, so as to make a more or less dense covering. A clear external separation into capitulum, scapus, and physa is not necessarily present. Some species have no sheath. Sometimes the scapus has solid papillae. Tentacles retractile, eight to twelve or more (e. g. thirty-two), their longitudinal muscle ectodermal. Sphincter weak mesogloal (see Part I, Text-fig. 1. and Pl. 22, fig. 7). Mesenteries either all macroemes, or else divided into macro- and microemes. Macroemes six pairs (rarely one or two additional unpaired ones) or fewer; microemes if present variable in number (see Part II, Text-fig. 8).

Species:

- Genotype, *H. chrysanthellum*, Peach, Johnst., 1847, p. 220.  
 (See also Gosse, 1860, p. 247; Haddon, 1889, p. 335; Walton and Rees, 1913, p. 65; Haddon, 1886, p. 1; Faurot, 1895, p. 127; Stephenson, 1918 A, p. 9; 1920 A, p. 440.)
- H. duodecimcirrata*, Sars, 1851, p. 142; Carlgr., 1893, p. 38.
- H. arctica*, Carlgr., 1893, p. 45.
- H. limnicola*, Aman., 1915, p. 89.
- H. aspera*, Steph., 1918 A, p. 10.
- H. chilensis*, McM., 1904, p. 223.
- H. kerguelensis*, Studer, 1878, p. 546. (See Kwietniewski, 1896.)
- H. arenaria*, Haddon, 1886, p. 616; 1889, p. 335. (See also Walton and Rees, 1913, p. 66.) And probably others.

I have been obliged to transfer *H. aspera* from *Halcampoides* to *Halcompa*, because on re-examination of some sections of it I find appearances which I take to indicate a mesogloal sphincter. The reasons for my overlooking it in my original investigation were that there is not much of it, and it was not until I had subsequently examined several other species with insignificant sphincters that I found out exactly where one must look for it in a deeply introverted and somewhat twisted specimen such as mine was. I had only transverse, and not the more serviceable longitudinal sections of the region where it lies, being further misled by mistaking certain parts of the endodermal circular muscle for a slight endodermal sphincter. There is also perhaps a fourteenth

perfect mesentery, but if so, whether it has a retractor is uncertain, and it is probably asymmetrical, not placed as in *Scytophorus*. But only more and better material can clear it up. *H. arenaria* I have left in the genus on the assumption that it has a mesogloal sphincter, but that remains to be proved.

#### HALCAMPOIDES, Dad., 1887.

See Appellöf, 1896, p. 3, and the references given under *Halcampa*. Fenja, Dan. Aegir, Dan. *Halcampomorpha*, Carlgr. *Halcampa* as used by Kwietniewski. *Halcampella* as used by Hertwig. ? *Halcampella*, Andres.

*Halcampidae* typically more or less worm-like, not necessarily with a clear distinction into seapus, capitulum, and physa. *Cinclides* may occur in the physa. Naked or incrusted. Tentacles twelve or more, can be retractile, and with the tentacular longitudinal muscle ectodermal. No mesogloal sphincter, but there may be a slight endodermal one. Six pairs of macrocnemes. Microcnemes present or not.

##### Species:

*H. abyssorum*, Dan., 1887.

*H. clavus*, Q. and G., 1833, p. 150. (See Hertwig, 1882, p. 92; Pax, 1912, p. 310; Appellöf, 1896, pp. 3, 13, &c.; and Haddon, 1889, p. 336.)

*H. maxima*, Hertw., 1888, p. 29. (See Wassilieff, 1908.)

*H. kerguelensis*, Hertw., 1888, p. 28.

*H. purpurea*, Studer., 1878, p. 545. (See Kwietniewski, 1896.)  
And probably others.

*H. minuta*, Wass., seems to be more like a *Haloclava* than a *Halcampid*. It is possible that of the species listed some may be synonyms of others—it has been suggested that *H. clavus* is the same as *H. purpurea* and *H. abyssorum*. *Halcampella endromitata*, Andres, and others, cannot yet be definitely allocated. In Wassilieff's description of *H. maxima* there are some remarks which suggest that he had some form other than a *Halcampoides* to deal with; but they may be due to a couple of critical misprints.

## PENTACTINIA, Carlgr., 1900, p. 1166.

Halcampidae with body which may be long, and physa. Scapus with papillae to which fragments may adhere. Tentacles typically twenty, their longitudinal musculature ectodermal. No sphincter. Ten macrocnemes present—the 'Edwardsia eight' + one couple pairing with the dorsolateral protoenemes. The sixth primary couple represented by two perfect but weak mesenteries. Four pairs of microcnemes, confined to distal part of body.

## Species :

*P. californica*, Carlgr., 1900, p. 1166.

## SCYTOPHORUS, Hertw., 1882, p. 104.

Halcampidae with body which may be long, with cuticle developed chiefly on the scapus. The physal end may attach itself. No verrucae. Tentacles fourteen, their longitudinal musculature ectodermal. Mesenteries fourteen, the usual primary six pairs + one couple, the individuals of the couple with their retractors facing one pair of directives. All these mesenteries are macrocnemes, but some may be without gonads. No sphincter. The ciliated tracts of the filaments may be peculiar.

## Species :

*S. striatus*, Hertw., 1882, p. 104.

*S. antarcticus*, Pfeff., 1889, p. 11. (See Carlgren, 1899, p. 7.)

## Family 2. ILYANTHIDAE, Gosse.

Ilyanthidae as used by Gosse, 1860, *pro parte*, i.e. excluding Ceriantharia, Edwardsiaria, and Halcampids.

Athenaria often attaining a fair size, frequently with stout bodies which are often capable of becoming vermiform. Suckers present or absent. Cinclides may occur in the physa or on the scapus. Patches of cuticle are sometimes present. Tentacles simple or capitate, eight, twelve, twenty, or more, up to about forty. Sphincter absent or slight and endodermal. Never fewer than ten pairs of mesenteries in adult animals, the number varying up to about eighteen pairs. They are usually all macrocnemes, even if there is some distinction among them, though in *Peachia* four at least of the ten pairs are imperfect and without gonad or filament, but they have strong retractors and cannot be called microcnemes. There is often only one siphonoglyphe, and this may bear a specialized upper end or conchula.

Genera: *Ilyanthus*, *Eloactis*, *Haloclava*,  
*Harenactis*, *Peachia*.

*Polyopis striata*, Hertw., may just possibly have been a battered member of this family.

## ILYANTHUS, Forbes, 1840.

Ilyanthidae with a physa. Body-form may be thickish, without suckers, but there may be patches of cuticle. Margin of scapus forms a collar with a narrow capitulum above it. Tentacles simple, in 3 cycles, from about 28 to 36. No conchula. Mesenteries the same in number as the tentacles, all macroenemes (perfect, with circumscribed retractor, and filament), but not all fertile. Seven tentacles form the primary cycle: these are held permanently over the mouth, and divide up those of the outer cycles into radiating groups. The arrangement is exactly bilateral, and not radial; *one directive tentacle is a primary, the other a secondary*. Tentacles of cycle 3 the longest.

## Species:

*I. mitchelli*, Gosse, 1853, p. 128; 1860, p. 232.

? *I. scoticus*, Forbes, 'Ann. N. H.', I, v. 183.

The only species to be certainly referred to this genus is *I. mitchelli*, which I have been able to study alive and anatomically. It is a unique and extraordinary form, and further details about it will, I hope, be shortly forthcoming. It is clear that *I. parthenopeus*, Andres, is something quite different from *I. mitchelli*, and merits at least a distinct genus, and as it seems to me a distinct family; see Andresiidae for further detail.

## ELOACTIS, Andres, 1883, p. 464.

Ilyanthidae with a physa which may adhere slightly. Column without verrucae, its upper margin well marked. Tentacles twenty, capitate, not fully retractile, the outer largest; tentacular longitudinal muscle ectodermal; tentacle-heads especially rich in sting-cells. No conchula. No sphincter. Mesenteries ten pairs, all macroenemes (see Part II, Text-fig. 9), probably all fertile. One siphonoglyphic.

## Species:

*E. mazeli*, Jourd., 1880, p. 41. (See Faurot, 1895, p. 152; and Rees, 1913, p. 70.) Perhaps others.

## HALOCLAVA, Verr., 1899, p. 41.

Ilyanthidae with body which may be long. Base physa-like but capable of adherence to small objects. The body has rows of adhesive suckers above. There is some sort of sphincter. Tentacles twenty, usually clavate. No conchula. Mesenteries ten pairs, all perfect, very muscular, but six pairs are larger and form a primary cycle.

## Species :

*H. producta*, Stimp., 1856, p. 110, is the genotype, and perhaps, others should also be included. (See Verrill, 1899.)

## HARENACTIS, Torrey, 1902.

Ilyanthidae with a physa which can flatten into a disc and stick to something. The body may attain great length; it is smooth, but has a vertical row of cinclides in the upper part of it, corresponding to each endocoel and exocoel. No conchula. No sphincter. Twenty-four simple tentacles. One siphonoglyphic. Longitudinal musculature of tentacles ectodermal. Mesenteries all macrocnemes, twelve pairs, only the six primary pairs usually fertile.

## Species :

*H. attenuata*, Torrey, 1902.

## PEACHIA, Gosse, 1855.

## Siphonactinia, Dan. and Kor., 1856.

Ilyanthidae with a physa, in which there are typically cinclides. Column can be thick, or can become vermiform by attenuation (see Part II, Text-fig. 7, A), without verrucae. A trifold conchula (which may have further subdivisions beyond the three main ones) is usually present in connexion with the opening of the one siphonoglyphic. No sphincter. Tentacles simple, eight or twelve. Mesenteries ten pairs (or six pairs in younger specimens); usually six pairs perfect, with strong diffuse or circumscribed-diffuse retractors, gonads, and filaments—more rarely only the eight protoenemes are perfect, but the other primary couples have their filaments and retractors. There are four secondary imperfect pairs without gonad and filament, but they have strong retractors and are not microcnemes.

## Species :

*P. hastata*, Gosse, 1855, p. 294. (See also Gosse, 1860, p. 235; Faurot, 1895, p. 136; Haddon, 1889, p. 337; Stephenson, 1920 A, pp. 446, &c.; Haddon and Dixon, 1885.)

*P. undata*, Gosse, 1858, p. 418; 1860, p. 239.

*P. triphylla*, Gosse, 1860, p. 243. (See Hornell, 1894, p. 78.)

*P. quinquecapitata*, McMurrich 1913.

*P. koreni*, McL., 1893, p. 144.

*P. hilli*, Wilsmore, 1911, p. 39.

And probably others.

I have cast the definition so that it covers the aberrant *P. hilli* as well as the typical forms, but it would not be surprising to find that that species merits separation from the



rest of the genus, on account of its seeming lack of a conchula and imperfection of some of the primary mesenteries. Certain species have been described under the generic names *Bicidium* and *Philomedusa*, but these are very likely larvae of various species of *Peachia* and *Halcampa*, parasitic on medusae.

#### Sub-tribe 2. ENDOCOELACTARIA, mihi.

Nynantheae with a definite base. Form variable, but the column without vesicles. Ectoderm of column nearly always with spirocysts, but probably without ectodermal muscle, at any rate usually. No sphincter. One or two siphonoglyphes. Body-wall may be thick and heavy, and the oral disc may be lobed—or both may be quite ordinary in appearance. Tentacles few or numerous, simple or with variously developed aboral swellings of mesogloea; either in two alternating marginal cycles or else arranged in a way unlike the usual anemone plan; but there is never more than one tentacle to each mesenterial space. Radial muscle of disc and tentacles ectodermal or with a mesogloea tendency. Mesenteries varying in detail, but with this in common, that after the first six couples are formed all subsequent pairs appear in the lateral endocoels, and have their longitudinal muscles oriented as in directives.

#### Family 1. HALCURIIDAE.

Halcuriidae as used by Carlgren, 1918, p. 24, *pro parte*, i. e. for Halcurias.

Endocoelactidae, Carlgr., 1897, p. 169.

Endocoelactaria without peculiarity of body-form such as lobing of disc and basal thickening of tentacles, and with a tendency to develop little groups of nematocysts in the body-wall ectoderm. One siphonoglyphe only. Tentacles simple, up to about seventy. Mesenteries rather well marked out into a few (six or ten) large perfect fertile filamented pairs with circumscribed retractors, and a number of further pairs without these appendages. Some of these smaller mesenteries are perfect, but they are all, beyond the first ten mesenterial pairs, confined to the uppermost part of the body and are virtually microcnemes.

Genera: Halcurias and Carlgrenia.

HALCURIAS, McM., 1893, p. 142.

Endocoelactis, Carlgr., 1897, p. 169.

Halcuriidae with definite but sometimes small base. The body is



sometimes elongate, and is smooth but for the presence, sometimes, of ectodermal batteries of nematocysts. Margin tentaculate or with a parapet, no distal lobing. Tentacles up to about seventy. Macrocnemes ten pairs, fertile, filamented, and with strong circumscribed to circumscribed-diffuse retractors. Microcnemes confined to upper part of body, either in regular cycles or irregularly placed, some of them usually perfect.

Species :

- H. pilatus*. McM., 1893, p. 142. (See also McMurrich, 1898 : 1901, p. 155 ; Carlgren, 1918, p. 25.)  
*H. carlgreni*, McM., 1901, p. 159. (See also Carlgren, 1897, p. 159, &c. ; 1914 ; and 1918, p. 26.)  
*H. endocoelactis*. Steph., 1918 A, p. 14.

CARLGRANIA. Steph., 1918 B, p. 109.

Halcouriidae with definite base, slight parapet and fosse, and no distal lobing. Ectoderm of column, at least in upper part, with nematocyst batteries. Tentacles about forty in the specimens so far collected. Macrocnemes six pairs, fertile, filamented, strong circumscribed retractors. In the lateral endocoels are four pairs of perfect microcnemes which run down the whole length of the body (see Part II, Text-fig. 16, c) : beyond these first ten pairs (six pairs macrocnemes and four pairs microcnemes) any additional microcnemes are confined to the upper part of the body.

- Species : *C. desiderata*, Steph., 1918 B, p. 109.

Family 2. ACTINERNIDAE. n. fam.

Halcouriidae as used by Carlgren, 1918, p. 24. pro parte.

Endocoelactaria with definite base. Body cylindrical or, more usually, expanded above, and in this case often divided into lobes, which are typically four or eight in number. There may or may not be collections of nematocysts in the body-wall ectoderm. Tentacles may be numerous, simple, or with mesogloal swellings on the aboral sides of some or all of them. A thick body-wall is a frequent characteristic. Two siphonoglyphes. There are a good many mesenteries, and the older ones are not marked off from the others as macrocnemes ; many are perfect ; the later ones may develop cyclically or bilaterally, and the partners of a pair be equal or unequal. The mesenterial musculature is not strong, and at least all stronger mesenteries are fertile.

Genera: *Actinernus*, *Synactinernus*, *Isactinernus*, *Synhalcurias*.

*ACTINERNUS*. Verr., 1879.

This is only part of Verrill's genus. Other forms sometimes assigned by mistake to it will be found under *Actinoscyphia* and *Polysiphonia*.

*Porponia*, Hertw., 1882, p. 125.

See Carlgren, 1914; Carlgren, 1918, p. 31, &c.; Stephenson, 1918 B, p. 127; Stephenson, 1920 A, p. 540.

Not *Actinernus* as used for *A. plebeius*, *A. saginatus*, *A. aurelia*.

*Actinernidae* with thick body which expands more or less distally, and is often but not always lobed, the lobes usually eight in number. Tentacles (except the youngest and sometimes the inner ones) with aboral mesogloecal swellings or bridges of varying development in different species, which may run up the tentacles almost to their tips. The tentacles usually in two cycles, and largest at the apices of the lobes. Numerous mesenteries, the older ones developed as usual in *Endocoelactaria*; after a certain point, however, they continue to appear in definite zones in a bilateral way, from the outer side of the zone inwards, usually. These mesenteries have the partners of a pair unequal. Mesenterial muscle weak.

Species:

*A. nobilis*. Verr., 1879, p. 474. (See Carlgren, 1918, p. 32.)

*A. elongatus*, Hertw., 1882, p. 111. (See Carlgren, 1918, p. 33.)

*A. robustus*, Hertw., 1882, p. 113. (See Carlgren, 1918, p. 34.)

*A. michaelisarsi*, Carlgr., 1918, p. 33.

*A. antarcticus*, Carlgr., 1914, p. 50; 1918, p. 35.

*SYNACTINERNUS*, Carlgr., 1918, p. 30.

*Actinernidae* with the body expanded above into eight lobes, four larger and four smaller alternating. Tentacles in at least two cycles, without basal swellings, largest at apices of the lobes, numerous. Radial muscle of disc and tentacles chiefly ectodermal. At least half the numerous mesenteries perfect. Mesenterial muscle not forming projecting retractors. The perfect mesenteries are cyclic in arrangement, beyond these are others of unequal size in upper part of body.

Species:

*S. flavus*, Carlgr., 1918, p. 31.

**ISACTINERNUS**, Carlgr., 1918, p. 29.

Actinernidae with distal part of body four-lobed, the lobes able to bend in over the mouth. Wall with very little papillae forming nematocyst batteries. Tentacles numerous, in at least two cycles, largest at the apices of the disc-lobes, the inner with small aboral mesogloea basal swellings, the outer with the swellings slighter or absent. Radial musculature of disc and tentacles chiefly ectodermal. Actinopharynx with very thick mesogloea. Mesenteries numerous, almost regularly arranged, cyclic, the partners equal, many of them perfect. Weak retractors in lower parts of older mesenteries.

Species :

*I. quadrilobatus*, Carlgr., 1918, p. 29.

**SYNHALCURIAS**, Carlgr., 1914, p. 68.

*Hyanthopsis* as used by Wassilieff, 1908, pro parte.

Actinernidae with the body not lobed above. There are little nematocyst batteries in the column ectoderm. Tentacles without basal swellings, up to over 100. Radial muscle of disc tending to become mesogloea, longitudinal muscle of tentacles ectodermal. Numerous mesenteries, all perfect in old specimens, their arrangement cyclic but not very regular, the two partners of a pair generally about equal. Mesenterial musculature weak, not forming projecting retractors.

Species

*S. elegans*, Wass., 1908, p. 8. (See Carlgr., 1914, p. 68; and 1918, p. 27.)

Sub-tribe 3. **MESOMYARIA**, mihi.

Nynantheae usually with a definite base and basilar muscles, but sometimes with a physa or an intermediate grade of base; sometimes the base is reduced: or it may be hollowed out into a cup or elongated as a slit, &c. The form is variable, from a worm-like burrowing condition to a broad flat dish shape or a flattened wrap-like condition, but the typical anemone form (more or less cylindrical or vase shaped) is the usual thing. In the advanced forms there is often a thick body-wall, and some of these exhibit ornamental knobs or roughnesses, crests, and so on, and in this connexion the tentacles may have aboral basal swellings of mesogloea. In some forms the body is divided into scapus and capitulum, and the scapus may have cuticle on it. There are never any true vesicles or acrorhagi, but sometimes suckers or verrucae. Cinclides often occur. The tentacles are usually simple, but may have the above-mentioned swellings, or even, rarely, thickenings of other different kinds. Their longitudinal musculature is ectodermal to mesogloea,

the latter condition fairly frequent among advanced forms. Not more than one tentacle communicates with each exo- and endocoel. The sphincter, if present, is mesogloea. Acontia are often present, and are the typical special stinging organs of the group; sometimes they are rudimentary and hard to detect. Secondary mesenteries appear in exocoels, not endocoels. Ectodermal muscle in the body-wall is exceptional. Mesenterial musculature is typically well developed; at its best very strong.

The ten families of Mesomyaria and the contained genera are defined in Part I of this paper. The only modification required is, that the word 'Mesomyaria' be substituted for the word 'Actiniina' in the family definitions there given. 'Actiniina' was used provisionally, pending the working out and publication of the groups set up in Part II.

#### Sub-tribe 4. ENDOMYARIA. mihi.

Nynantheae with a definite base save in one case, but it may be reduced or rather physa-like, or slit-like, or converted into a float, &c. Usually there are basilar muscles. Form variable, body-wall either smooth or with verrucae or acrorhagi or vesicles, which may become complex outgrowths—more than one of these things may be present in the same animal. There is not the same tendency to ponderous body-walls (though of course these are sometimes fairly thick) and knobs and crests of mesogloea as in some Mesomyaria. Ectodermal muscle in the body-wall is exceptional. Cinclides do occur, but their distribution is little known. The tentacles are simple or complicated in various ways (see Part II, Text-figs. 14 and 19), but do not have basal mesogloea swellings. Their longitudinal musculature is less often mesogloea than in Mesomyaria. At their best development, in forms of warm seas, they may form complex tufts and give a frill-like or seaweed-like effect (see Part II, Text-fig. 19, and Text-fig. 18 for vesicles). In some forms not more than one tentacle joins each endocoel and exocoel. In others there is more than one on some or all of the endocoels, but not more than one on each exocoel. In still others the exocoels also may have more than one—so that sometimes there are many per endo- and exocoel. Sometimes the tentacles are reduced to sessile vesicular structures. The sphincter, if present, is endodermal of some grade, may be very strong and circumscribed at its best though often weak or diffuse, &c. There are never any acontia. Secondary mesenteries develop in exocoels. Mesenterial musculature is typically well developed; at its best very strong.

## Family 1. CONDYLANTHIDAE, n. fam.

Antheadae as used by Carlgren, 1899, p. 9, pro parte.

Actiniidae as used by Pax, 1907, pro parte, &c.

Endomyaria with definite base. Body-wall unspecialized, without verrucae, the body sometimes elongate and half vermiform. Tentacles retractile, in several cycles, simple, not more than one to each exo- and endocoel. No sphincter. Radial musculature of disc and tentacles ectodermal. Mesenteries divided into macro- and microcnemes, macrocnemes (bearing gonad, filament, and strong retractor) six pairs; microcnemes without those structures.

Genus: *Condylanthus*.

CONDYLANTHUS, Carlgr., 1899, p. 15.

*Charisea*, Torrey, 1902.

With the characters of the family.

## Species:

*C. magellanicus*, Carlgr., 1899, p. 15.

*C. saxicola*, Torrey, 1902.

There seems to be no adequate way of separating off these two species into two genera, the differences being seemingly of specific value only. I have therefore listed *Charisea* as a synonym of *Condylanthus*, which has priority.

## Family 2. MYONANTHIDAE, n. fam.

Antheadae as used by McMurrich, 1893, p. 146, pro parte.

Actiniidae as used by Pax, 1907, pro parte, and Haddon, 1898, p. 414, pro parte.

Gonactiniidae as used by Carlgren, 1900, p. 15, pro parte (*Boloceroides*).

Endomyaria with definite base, which may be slight, with or without basilar muscles. Body-wall smooth or with suckers. Ectodermal muscle and spirocysts in body-wall and actinopharynx present or absent. No vesicles. Tentacles simple, not more than one per exo- and endocoel; they may be deciduous or not; their longitudinal muscle is ectodermal. Sphincter absent or endodermal, not very strong endodermal, diffuse or circumscribed-diffuse. Siphonoglyphes present or absent. Mesenteries NOT divided into macro- and microcnemes. Perfect mesenteries six pairs. Fertility affects the older mesenteries, excepting sometimes the directives. Retractors strong or weak.

Genera: *Myonanthus*, *Macroductyla*, *Bolocerooides*, *Nevadne*.

**MYONANTHUS**, McM., 1893, p. 151.

Myonanthidae with smooth body and slight fosse within the margin. Tentacles retractile, without sphincters. Sphincter definite, diffuse, and may have a good deal of anastomosis between its processes. All mesenteries fertile save the directives and the youngest.

Species:

*M. ambiguus*, McM., 1893, p. 151.

**MACRODUCTYLA**, Haddon, 1898, p. 431.

Myonanthidae with a delicate skin covered with little adhesive suckers. Large suckers on upper part of body. Fragments may adhere to it. No capitular rim or acrorhagi. Tentacles may be long and large, and are without sphincters. Sphincter not strong, sessile, circumscribed diffuse. Retractors strong, circumscribed diffuse. All mesenteries fertile.

Species:

*M. aspera*, H. and S., 1893, p. 124; Haddon, 1898, p. 431.

There is a slight ambiguity in Haddon's definition of this genus—I take his meaning to be that there are six pairs of perfect mesenteries, but if by any chance it is otherwise the genus will have to go to Actiniidae.

**BOLOCEROIDES**, Carlgr., 1899, p. 43.

Myonanthidae with smooth body and tentaculate margin. No sphincter, no true siphonoglyphes, no basilar muscles. Ectoderm of body-wall and actinopharynx has spirocysts and muscle fibres as well as that of disc and tentacles. Tentacles provided with sphincters, therefore deciduous. All stronger mesenteries fertile save directives.

Species:

*B. McMurrichi*, Kwiet., 1898, p. 394. (See also Carlgr., 1899, p. 43; 1900, p. 16.)

*B. hermaphroditica*, Carlgr., 1900, p. 18.

A discussion of the systematic position of this genus will be found in Part II, p. 506, &c.

**NEVADNE**, n. gen.

*Gyrostoma* as used by Annandale for *G. glaucum* (1915, p. 70).

Myonanthidae. The one known form has longish body and long



tentacles, living in brackish water in India. There is a slight base. Body smooth but for microscopic prominences containing nematocysts. The outer tentacles are the largest. Six pairs of perfect mesenteries. Gonads on the older imperfect mesenteries. No true retractors or sphincter. Tentacles without sphincters.

Species:

*N. glauca*, Annan., 1915, p. 70.

It has been necessary to erect a new genus for Annandale's *Gyrostoma glaucum*, which cannot come within the genus *Gyrostoma* or even into the Actiniidae, with its six pairs of sterile perfect mesenteries and their feeble musculature. It seems to be a distinct and interesting form, which fits into the Myonanthidae well.

### Family 3. ANDRESIIDAE, n. fam.

Ilyanthidae as used by Andres, 1883, p. 457, pro parte.

Endomyaria. The only known genus has a body capable of attaining a great length, and devoid of a pedal disc, being adapted for burrowing. Body without verrucae, but with a notched parapet and a fosse at the margin. Tentacles long, retractile, in four regular cycles, graded in size from within outwards. Small circumscribed endodermal sphincter. Longitudinal musculature of tentacles ectodermal. Twenty-four pairs of mesenteries in three cycles, all perfect but in varying degrees, all fertile save sometimes the directives, and provided with diffuse retractors which are not confined to the larger mesenteries only.

The above is a short statement of the chief characteristics of the only species as yet referable to this family, *Andresia parthenopea*. This form was described by Andres (1883, p. 459) as *Ilyanthus parthenopeus*, and further dealt with by Faurot (1895, p. 154) and Simon (1892). It is a species which does not conform to one's idea of Athenarian structure at all well, and certainly cannot remain in the genus *Ilyanthus*, as represented by *I. mitchelli*, which I have been able to investigate anatomically. I here suggest the generic name *Andresia* for it, after Angelo Andres, author of the largest monograph on Actiniaria yet attempted. I have proposed (Part II, p. 522) to have a separate family *Andresiidae* for it, because it cannot well be placed in any known



family without making that family rather heterogeneous. It might be included in Actiniidae on the same principle by which I included *Halcampactis*, a genus with no base, in the Phelliidae—but there it was a case where there was transition to be traced between forms with no base and those with a base; and it does not follow that the same course need be observed in the two cases. At any rate I put forward the Andresiidae tentatively, as being the most expedient plan at the moment.

#### Family 4. ACTINIIDAE, sens. strict.

Actiniidae, Gosse + Bunodidae, Gosse, as used by Haddon, 1898, p. 414, but excluding *Antheopsis*, *Macroactyla*, and *Myonanthus*, which he includes.

Including Actiniidae (or Antheadae) and Bunodidae of most authors, with certain genera removed. Bunodidae, Gosse = Cribrinidae, McM. = Bunodactidae, Verr.

Including Boloceridae, McM.; Glyphactininae, Roule; Tealidae, Hertw.; Isohexactiniae, Kwiet.; Antheomorphidae, Hertw.; Liponemidae, Hertw., pro parte; Holactiniae, Boveri, &c.

Endomyaria with a base which is sometimes rather reduced, usually well developed; or it may be elongate through attachment to a spine. Body-wall smooth or with verrucae, but without vesicles. Margin tentaculate or distinctly marked off as a parapet or collar; with or without acrorhagi. Tentacles simple or with paired lateral enlargements; provided with sphincters rarely, more usually not; their longitudinal musculature usually ectodermal, rarely mesogloal. Sphincter absent or endodermal; weak or strong; exhibiting various grades of development—diffuse, circumscribed, &c. Not more than one tentacle to each exo- and endocoel. Mesenteries NOT divided into macro- and micro-nemes, number of perfect mesenteries usually considerable, always more than six pairs in adult animals. Retractors variable, but often strong. Usually fertility affects either all the mesenteries or most of the older ones, though in other cases these are sterile.

Genera: *Actinia*, *Anemonia*, *Gyrostoma*, *Condy-lactis*, *Parantheopsis*, *Bunodactis*, *Tealia*, *Epiactis*, *Isotealia*, *Pseudophellia*, *Bolocera*, *Leipsiceras*, *Boloceropsis*, *Dofleinia*, *Ixa-lactis*, *Glyphostylum*, and perhaps others; see below.

ACTINIA, Browne.

*Diplactis*, McM., 1889, p. 110.

*Hormathia* as used by Hertwig for *A. delicatula* (1888, p. 15).

Actiniidae with smooth body having a collar-like margin, with a fosse between itself and the tentacles, in which lie acrorhagi. The latter are simple or more or less compound, usually conspicuous (e.g. blue) in colour, and can be covered up by the margin in contraction. Tentacles simple and typically retractile, their longitudinal musculature mostly or wholly ectodermal. Sphincter absent to weak or strong diffuse, sometimes with a mesogloal tendency, but endodermal actually. Mesenteries may be all fertile save directives. Retractors diffuse, may be strong. (Sphincter of *A. equina*, Part II, Text-fig. 11, B.)

Species:

*A. equina*, L., 1766-8, p. 1088. (= *A. mesembryanthemum*, Ellis and Solander, 1786, p. 4 = *A. cari*, D. Ch., 1825, p. 233.

See Gosse, 1860, p. 175; Pax, 1907, p. 53; Clabb, 1898; Andres, 1883, pp. 397 and 402; and Simon, 1892.)

*A. delicatula*, Hertw., 1888, p. 15. (See Haddon, 1898, p. 459; Carlgr., 1900, pp. 31-3.)

*A. bermudensis*, McM., 1889, p. 111.

*A. tenebrosa*, Farquhar, 1898, p. 535; Stuckey, 1909, p. 380.

*A. kraemeri*, Pax, 1914, p. 413.

I have listed under *Actinia* those species which seem to definitely belong to the genus as here defined. Sometimes rather vague forms are allotted to it, and there seems to be a certain amount of confusion with regard to it, and to the allied genera. It is actually quite a distinct genus, and there seems to be no reason for mixing it up with *Anemonia* or *Gyrostoma*. *A. equina* is of course the commonest of our British anemones, and *A. tenebrosa* seems to be its southern representative. Verrill ('Trans. Connect. Acad.',

xi, p. 51) describes an *A. melanaster*, but its systematic position is uncertain.

#### ANEMONIA, Risso.

*Isactinia*, Carlgr., 1900, p. 33.

Actiniidae with smooth body having a parapet formed by acrorhagi, which cannot therefore be covered up by the margin: they may vary a good deal in extent of development, and in some cases are almost suppressed, next to invisible. The tentacles may be long, and are typically non-retractile; their longitudinal musculature ectodermal. Sphincter diffuse or more or less circumscribed or intermediate, not very strong. Retractors variable, may be strong. Gonads may appear from the first cycle onwards. Marked siphonoglyphes not always present, nor directives necessarily. (Sphincter of *A. sulcata*, Part II, Text-fig. 11, E.)

##### Species:

*A. sulcata*, Penn., 1766. (= *Anthea cereus*. Ellis and Solander, 1786. See Gosse, 1860, p. 160; Andres, 1883, p. 405; Pax, 1907, p. 62; and Simon, 1892.)

*A. manjano*, Carlgr., 1900, p. 41.

*A. theloteria*, Pax, 1907, p. 69.

*A. badia*, Carlgr., 1900, p. 33.

*A. hemprichi*, Klunz., 1877, p. 72. (See Pax, 1907, p. 57.)

*A. carlgreni*, Lager, 1911, p. 226.

*A. citrina*, H. and S., 1893, p. 125; Haddon, 1898, p. 416.

Possibly *A. erythraea*, H. and E., and others may come here. Probably *Comactis flagellifera*, Dana, is only *A. sulcata*. I have fused *Anemonia* and *Isactinia* and made one definition cover both, because I cannot feel convinced of any real distinction between them. The main point seems to be a slightly different grade of sphincter, but it is not enough for separation in a family like this.

*Gyrostoma*, Kwiet., 1898, p. 424.

*Paranemonia*, Carlgr., 1900, p. 61.

Actiniidae with smooth body and a more or less well-marked margin and usually some sort of fosse. There are no acrorhagi, but sometimes the margin is notched. Tentacles simple, their longitudinal musculature ectodermal. Sphincter absent, or diffuse or circumscribed, but not very strong; sometimes with a mesogloal tendency though actually endodermal. Retractors weak or strong, diffuse to circumscribed diffuse.

Gonads may appear from cycle 1 onwards. Siphonoglyphs variable in number, there may be several—also directives; latter may be absent.

Species:

- G. hertwigi*, Kwiet., 1898, p. 424, is the genotype. (See Haddon, 1898, p. 420.)
- G. ramsayi*, H. and S., 1893, p. 124; Haddon, 1898, p. 420.
- G. kwoiam*, H. and S., 1893, p. 125; Haddon, 1898, p. 422.
- G. cinerea*, Cont., 1844, p. 183. (See Pax, 1907, p. 36.)
- G. tristis*, Carlgr., 1900, p. 36.
- G. dubia*, Carlgr., 1900, p. 38.
- G. Stuhlmanni*, Carlgr., 1900, p. 39.
- G. Sancti-thomae* Pax, 1910, p. 177.
- G. incertum*, McM., 1904, p. 230.
- G. selkirkii*, McM., 1904, p. 227.
- G. dysaneritum*, Pax, 1907, p. 48; 1909.
- G. haddonii*, Lager, 1911, p. 229.
- G. sulcatum*, Lager, 1911, p. 230.

Other species which may be referred with a query to the genus are *G. tulearense*, Pax, 1909, p. 404; *G. inequale*, McM., 1893, p. 149; *G. adhaerens*, H. and E., 1832, p. 258 (Pax, 1907, p. 51); *G. dichogama*, Kirk and Stuckey, 1909, p. 384; *G. olivacea*, Hutton, 1878 (Stuckey, 1909, p. 381); and *G. insessa*, Gravier, 1918, p. 3.

The above list includes forms which have been erroneously placed under *Anemonia*, and had to be transferred. The two genera have been a good deal confused, and especially when dealing with preserved material it is difficult to be certain about them. I have included *Paranemonia* as represented by *P. cinerea* in this genus, because it seems to me to be simply a *Gyrostoma* without directives, and not worthy of a distinct genus. *G. glaucum*, Anman., is no *Gyrostoma*, and needs a new genus (see p. 263).

CONDYLACTIS, D. and M., 1866.

*Cereactis*, Andres, 1880.

? *Ilyanthopsis* as used by Hertwig for *I. longifilis* (1888, p. 13).

Actiniidae which sometimes reach a large size (*C. passiflora* may be a foot across). Body with verrucae in the upper part, which may be well developed, or weak, or practically or even entirely absent; sometimes they are arranged in vertical rows; fragments may adhere

to them. There are no acrorhagi, but there is a well-marked margin or collar. Tentacles simple, may be long and large, their longitudinal muscle ectodermal or with occasional anastomosis. Sphincter absent or very weak diffuse. Strong retractors. As a rule the mesenteries are all or mostly perfect and fertile, directives may be sterile; more rarely only twelve pairs perfect. Brood-pouches sometimes occur in the females. The tentacles and mesenteries may run in eights or tens. &c., as well as sixes.

Species :

- C. aurantiaca*, D. Ch., 1825, p. 438. (See Andres, 1883, p. 455 ; Pax, 1907, p. 22.)  
*C. passiflora*, D. and M., 1866, p. 31. (See Pax, 1910, p. 171 ; McMurrich, 1889, 'Journ. Morph.')
- C. georgiana*, Pfeff., 1889, p. 15. (See Carlgren, 1899, p. 13.)  
*C. kerguelensis*, Studer, 1878, p. 524. (See Pax, 1907, p. 32.)  
*C. erythrosoma*, H. and E., 1832, p. 257. (See Pax, 1907, p. 30.)  
 ? *C. cruentata*, Dana, 1849, Syn. p. 8, pro parte. (See Carlgren, 1899, p. 10 ; Pax, 1907, p. 26 ; McMurrich, 1893 and 1904 ; and Clubb, 1908, p. 2.)

There is a certain amount of ambiguity about this genus, or about the way in which it has been understood. Some forms have been split off from it and established under the separate name *Parantheopsis*, and these (*P. cruentata* and *P. ocellata*) seem to have acrorhagi of some sort, and on account of this and their lack of sphincter they stand half-way between *Condylactis* and *Bunodactis*. For *Condylactis* is essentially a genus with smooth collar and no acrorhagi; and *Bunodactis* is wide enough in its limits already, without the inclusion of sphincterless forms. To avoid too great a fusion of genera it is perhaps wisest to retain three : *Condylactis* for forms with smooth collar and no acrorhagi or appreciable sphincter ; *Parantheopsis* for such as have vertical rows of verrucae and also acrorhagi but little or no sphincter : and *Bunodactis* for those which have vertical rows of verrucae, usually acrorhagi, and some sort of sphincter—this may, admittedly, be weak, but typically is circumscribed. It seems possible that two distinct species have been described and confused under the name *cruentata* ; the descriptions rather suggest this, and that one of the two is a *Condylactis*

and the other a *Parantheopsis*. Hertwig's *Ilyanthopsis longifilis* is probably *C. passiflora*. *C. hertwigi*, Wass., is no *Condylactis*. It has, so far as one can tell, good acrorhagi and a weakish circumscribed-diffuse sphincter. If, as stated, it has no verrucae it should go to *Anemonia*. If it has, to *Bunodactis*. *C. parvicornis*, Kwiet., does not seem to be a very typical *Condylactis*, possibly that also is a *Parantheopsis* or *Bunodactis*.

PARANTHEOPSIS, McM., 1904, p. 233.

See note under *Condylactis*.

Actiniidae with verrucose body, the verrucae usually above; they are in vertical rows, ending, at least some of them, in acrorhagi (which are not necessarily nematocyst batteries); foreign bodies sometimes adhere to the verrucae. No sphincter or only a trace. All or a good many of the mesenteries perfect, and all may be fertile save directives. Good retractors. Tentacular longitudinal muscle of the simple tentacles ectodermal. Tentacles and mesenteries may be hexamerous or octamerous.

Species:

*P. cruentata*, Dana, 1849, pro parte. See under *Condylactis cruentata* for references.

*P. ocellata*, Les., 1828, p. 79. (See McMurrich, 1904.)

BUNODACTIS, Verr., 1899.

*Cribrina*, Ehr., pro parte; *Bunodes*, Gosse, 1855; *Aegeon*, Gosse, 1865; *Anthopleura*, D. and M., 1860; *Aulactinia*, Verr., 1862; *Evactis*, Verr., 1868; *Bunodella*, Verr., 1899; *Actinioides*, H. and S., 1893.

Actiniidae. A large genus of forms which are some of them easily retractile, others of more lax habit and only retractile with difficulty if at all. The body has regular vertical rows of verrucae, which are sometimes graded in length, and in size of the individual verrucae, according to the cycles of mesenteries they are connected with, and this may be accompanied by colour distinctions between the verrucae. Foreign bodies are often attached to the verrucae, which may also be somewhat lobed, distally. Acrorhagi are usually developed in connexion with the upper ends of at least some of the rows; but they may be there or not even in one and the same species. They may be simple, small or large, or decidedly compound. Sphincter variable, never very

powerful, but ranging from weak diffuse to more definite diffuse and slightly or distinctly circumscribed, weak or moderate in development; the state may vary even within one species, but the circumscribed form is the more usual and may attain a good strength. (Some of the weaker *Bunodactis*-sphincters are illustrated in Part II, Text-figs. 11 D, F, and 12, D, E.) Tentacles simple, their longitudinal muscles ectodermal. Retractors often strong, diffuse to circumscribed diffuse or even circumscribed. Gonads may appear on the older mesenteries, or all mesenteries may be perfect and fertile, save sometimes the directives. Brood-pouches may occur. Siphonoglyphes and directives variable in number. Symmetry hexamer, octamer, &c., or irregular.

Species :

The genotype is *B. gemmacea*, Ellis and Solander, 1786, p. 3.  
(See Gosse, 1860, p. 190; G. Y. and A. F. Dixon, 1889, p. 321.)

The other British species are *B. thallia*, Gosse, 1854, p. 283  
(see Gosse, 1860, p. 195; G. Y. and A. F. Dixon, 1889, p. 310).  
*B. ballii*, Cocks, 1849 (see Gosse, 1860, p. 198), and *B. alfordi*, Gosse, 1865, p. 41.

Foreign species numerous.

This is a genus somewhat parallel to *Sagartia* among the Mesomyaria. Its synonymy has been much discussed. The genus *Cribrina*, like *Urticina*, seems too vague to be adopted. Against one's wishes it seems necessary to let the familiar *Bunodes* lapse, since the name was pre-occupied for a Eurypterid in 1854; and Verrill's name *Bunodactis* steps into the breach with several synonyms. There may be some forms which have been wrongly placed under the genus, and their position should be reconsidered if they do not come under the above definition, which is wide enough already. The genera *Bunodactis*, *Anthopleura*, and *Aulactinia* have already been fused by Torrey (1906, pp. 47-52), and I fully agree with him that there is no valid way of separating them. I now add *Actinioides* to the list of synonyms. It has always represented the *Bunodes* species with the weaker sphincters, but apparently because of its being placed in the Actiniidae while *Bunodes* was placed in the Bunodidae, the similarity was overlooked. It is now evident that the Bunodidae and Actiniidae are one and the same family (see Part II, p. 526), and the two genera can no longer be



separated. The sphincters show a graded series from weak to fairly strong, and from diffuse to more circumscribed, so that it would be difficult to draw a boundary line (cf. Part II, Text-figs. 11, D, F, and 12, D, E, for some of the weaker ones). And there are no other special points of difference. *B. capitata* is said to have only six pairs of perfect mesenteries, in which case it should be transferred to *Macrodaetyla*, and then the latter name might have to give way to the earlier name *Aulactinia*, in a new sense. It is possible of course for young specimens of a species to have only six pairs of perfect mesenteries, but if it persists in the adult the form needs exclusion both from *Bunodaetis* and from the Actiniidae too.

TEALIA, Gosse, 1858, p. 417; 1860, p. 205.

*Rhodactinia*, Agassiz, 1847, p. 679; 1865, p. 13.

Actiniidae. Body sometimes low and broad, attaining however a high cylindrical form in full expansion. Body in some specimens very mobile and changeable in form, in others less so. Column with verrucae which are not usually arranged in definite vertical rows, at any rate in the adult; they are sometimes strongly, sometimes very weakly developed, in still others quite absent—and all this within one and the same species, probably. There is a parapet and fosse, but no acrorhagi in the ordinary forms—they occur in certain Antarctic cases though. Tentacles simple, stout, their longitudinal muscle varying from ectodermal to mesogloal, the latter being perhaps the more typical condition in the common forms. Strong circumscribed sphincter. Tentacles and mesenteries often in multiples of ten in the common forms, but not invariably. Primary mesenteries may be fertile or sterile. Retractors strong or very strong, diffuse or circumscribed diffuse. All mesenteries may be perfect. (For *T. crassicornis*, see Part II, Text-figs. 7, B, and 12, B.)

Species:

*T. crassicornis*, O. F. Müller, 1776, p. 231. (*T. coriacea*, Cuvier, 1797, p. 653.) (See also Gosse, 1860, p. 209; Carlgren, 1893, p. 58; Carlgren, 1902, p. 38; Clubb, 1908, p. 9; McMurich, 1911.) (*Bolocera eques*, Gosse, 1860, p. 351; *Madoniaetis lofotensis*, Dan., 1887, p. 47, pro parte.)

*T. earlgreni*, Clubb, 1902, p. 297.

*T. sulcata*, Clubb, 1902, p. 295.

*Tealia* seems to be the famous genus for synonymy-discussions, and I will add as little as possible. I cannot

pretend to go into detail about it, but I venture to support *Tealia* as the best name to use, even if the legality is doubtful—in any case something would be doubtful. *Urticina* is too ambiguous, and although it probably contained one of our common forms it seems justifiable to reject it in favour of the non-ambiguous *Tealia*. *Rhodactinia*, Agassiz, has priority, but although *R. davisii* seems to be identical with one of the forms more usually called *crassicornis* or *coriacea*, yet the genus is insufficiently described and is not free from ambiguity. *Tealia* is well defined and a familiar name, and seems clearly to have the advantage.

I cannot accept Carlgren's division of the genus into two distinct genera—*Tealia* and *Rhodactinia*—because it cannot (as McMurrich has already pointed out) be upheld by anything stable. With regard to species under the genus, I do not like to speak with finality; but my experience with living specimens and study of literature suggests that there is really no valid way of splitting up our British forms into species—I imagine that they are all races or forms of one variable species, but the warts and other things do vary a great deal. This has not always been my opinion, and it is the kind of point about which one is liable to change one's mind more than once—the other possibility being to regard our British forms as two species (the extremes are certainly very different from each other in appearance) with intermediate grades. Clubb's two Antarctic species are certainly distinct from ours, but seem very like each other, and in some ways verge towards *Bunodactis*—might even be members of that genus, though *Tealia*-like in build and probably best left where they are. As to the right specific name for the British species, it will perhaps always be a disputed thing, but on the idea that we have only one variable species the name *crassicornis* has priority over *coriacea*. I have seen *Bolocera eques*, Gosse, alive, and it is simply a form of *T. crassicornis*.

It has been suggested that the irregularly arranged verrucae of *Tealia* must really be in vertical rows since they

communicate with mesenterial spaces. But although this is true in a sense, it smothers the more important fact that in *Tealia* the total arrangement of warts on the body-wall as a whole presents an irregular appearance to the eye, whereas in the contrasting *Bunodactis* the warts run in regular vertical series visible as such, and often with a cyclic arrangement corresponding to the cycles of endocoels, and even coloured differently according to cycle in some cases, so that in the end the difference is a marked one.

*EPIACTIS*, Verr., 1868.

*Epigonactis*, Verr., 1899, p. 378.

*Glyphoperidium*, Roule, 1909, p. 10.

NOT *Leiotealia*, Hertw., 1882, p. 37—which is probably a synonym of *Aureliania*; see note under that genus on p. 292.

Actiniidae in which the base may be well developed, or somewhat reduced, or may be crack-like through attachment to a spine. Wall smooth, no verrucae or acrorhagi, but well-marked parapet and fosse. There may be young ones adherent to the surface, or even shallow or deep brood-pouches. Tentacular longitudinal muscle ectodermal or with a tendency to anastomosis; disc radial muscle ectodermal or mesogloal. Sphincter well developed, circumscribed, varying in strength but usually very strong, sometimes exhibiting a good deal of anastomosis of processes. Retractors diffuse, circumscribed diffuse, or even circumscribed, often very strong. Mesenteries may be all perfect; gonads from cycle one onwards, or not; or on all, save perhaps the directives. (For two *Epiactis* sphincters see Part II, Text-fig. 12, A and C.)

Species:

*E. prolifera*, Verr., 1868, p. 492. (*E. fertilis*, Andres, 1883, p. 574.) See also Torrey, 1902, and McMurrich, 1901.

*E. fecunda*, Verr., 1899, p. 378. (*E. regularis*, Verr., 1899, p. 380.) (? *E. spitzbergensis*, Kwiet., 1898, p. 134, pro parte.)

*E. marsupialis*, Carlgr., 1901, p. 482.

*E. badia*, McM., 1893, p. 194.

*E. thompsoni*, Coughtrey, 1874. (See Stuckey, 1909, p. 370.)

*E. novo-zealandica*, Steph., 1918 A, p. 24.

*E. ritteri*, Torrey, 1902, p. 393.

*E. bursa*, Roule, 1909, p. 11.

*E. vas*, Roule, 1909, p. 13.

*E. dubia*, Wass., 1908, p. 20, may be an *Isotealia*.

#### ISOTEALIA, Carlgr., 1899, p. 24.

Actiniidae with smooth wall and well-marked margin provided with some sort of acrorhagi; there may be cuticle. Sphincter well developed, circumscribed. Tentacular longitudinal musculature ectodermal. Retractors fairly developed or strong. Gonads absent on older mesenteries, or present on all save directives.

Species:

*I. antarctica*, Carlgr., 1899, p. 25, and probably *I. dubia*, Wass., 1908, p. 20.

#### PSEUDOPHELLIA, Verr., 1899, p. 376.

Actiniidae in which the scapus is covered with a thick soft cuticle, the capitulum smooth and with parapet and fosse. There may be brood-pits in the scapus. Sphincter circumscribed. Strong retractors.

Species:

*P. arctica*, Verr., 1868, p. 328; 1899, p. 376.

This genus seems to be a sound member of the family, but more details about it are desirable.

#### BOLOCERA, Gosse, 1860, p. 185.

*Liponema*, Hertw., 1882, p. 129. (See Hertwig, 1888, p. 17; McMurrich, 1893, pp. 160 and 209; Carlgren, 1899, p. 39; Haddon, 1898, p. 429.)

Actiniidae with smooth body (no verrucae or acrorhagi) and unspecialized margin which may be tentaculate or have some sort of fold. Tentacles provided with basal sphincters so that they are deciduous; they are variable in size and number, sometimes very large, at others very numerous, or again neither unusually large nor numerous. Sphincter diffuse, may be well developed, sometimes with one or more of its processes predominating in size over the others, or with a tendency to circumscription. Diffuse retractors. Gonads may appear on the older cycles, or these may be sterile. Tentacular longitudinal muscle ectodermal. Perfect mesenteries variable in number; sometimes all are perfect.

Species:

*B. tuediae*, Johnst., 'Mag. Nat. Hist.', v. 163. (See Gosse, 1860, p. 186; Walton, 1908, p. 215; Stephenson, 1918 B, p. 112.)

*B. longicornis*, Carlgr., 1891, p. 241. (See Carlgren, 1893, p. 50; Stephenson, 1918 A, p. 20.)

- B. kerguelensis*, Studer, 1879, p. 544. (See Kwietniewski, 1896.)  
*B. multicornis*, Verr., 1879, p. 198. (See Carlgren, 1902 (Olga), p. 36.)  
*B. brevicornis*, McM., 1893, p. 158.  
*B. pannosa*, McM., 1893, p. 156.  
*B. occidua*, McM., 1893, p. 154.  
*B. multipora*, Hertw., 1882, p. 129. (See also references given above for *Liponema*.)

The genus *Bolocera* should be limited to the above definition and list of species, as regards known forms. *B. pollens* has now a genus apart on account of its sphincter. *B. eques* is a *Tealia*. *B. norvegica* is of doubtful standing. *B. africana* is, according to Carlgren (1911, p. 21), a *Sagartid* wrongly described as a *Bolocera*.

LEIPSICERAS. Steph., 1918 B, p. 112.

Actiniidae with smooth wall, no verrucae or acrorhagi. Very strong circumscribed sphincter. Tentacles provided with sphincters, therefore deciduous.

Species:

*L. pollens*, McM., 1898, p. 230.

This genus was separated from *Bolocera* on account of the sphincter. It seemed advisable because of the wide gap between the typically diffuse *Bolocera*-sphincter and the elongate circumscribed muscle with a mesogloal axis found in *L. pollens*; there is a gap here, not a series as in *Bunodactis*.

BOLOCEROPSIS, McM., 1904, p. 255.

Actiniidae with smooth body and tentaculate margin. The only known species has large tentacles rather like those of a *Bolocera*, but without tentacle-sphincters; their longitudinal muscle ectodermal. Sphincter and retractors diffuse.

Species:

*B. platei*, McM., 1904, p. 255.

Whether there is really any sound distinction between this genus and *Gyrostoma* it is not easy to decide, but pending further knowledge it is safest to let it stand. The nature of the margin may be quite a good distinguishing point.

*DOFLEINIA*, Wass., 1908, p. 13.

Actiniidae with smooth body. The only described form has large tentacles rather like those of a *Bolocera*, and both these and the disc are covered with papillae, plainly visible to the naked eye, and which represent batteries of nematocysts. Longitudinal muscle of tentacles ectodermal. Sphincter and retractors diffuse.

Species :

*D. armata*, Wass., 1908, p. 14.

This is a genus not very clear in its exact relationships, but it does not seem to fuse readily with any other, and the papillose disc and tentacles are a distinct feature.

*IXALACTIS*, Haddon, 1898, p. 443.

Actiniidae with the wall smooth below, with suckers above, and a definite crenulated parapet. Disc flat when fully expanded, but often thrown into lobes, and not fully retractile. Tentacles numerous, the aboral side of each being smooth, the oral side flattened, and with symmetrical lateral swellings, so that the whole looks not unlike a knotted cruciferous seed-pod in some conditions. Sphincter moderately developed, circumscribed.

Species :

*I. simplex*. H. and S., 1893, p. 123. (See Haddon, 1898, p. 443.)

A very distinct genus. Probably the form photographed by Saville-Kent as *Condylactis*, sp. It is a possibility that the genus is identical with *Ragactis* as represented by Andres's figures of *R. pulchra*—at any rate they suggest it, and it would be an interesting point to follow up.

*GLYPHOSTYLUM*, Roule, 1909, p. 14.

Actiniidae. In the one form described the body is a long trumpet with short stout tentacles. The tentacles are thicker on one face than the other, and their longitudinal musculature is ectodermal and much stronger on the thick side than the other. Smooth body-wall and no sphincter.

Species :

*G. calyx*. Roule, 1909, p. 16.

Roule (1909, p. 2) has set up a sub-family Glyphactininae of the Antheidae (Actiniidae), to rank equal with two other sub-families, the Bolocerinae and Actininae. His sub-family



includes two genera, *Glyphoperidium* and *Glyphostylum*. In the first place *Glyphoperidium* seems undoubtedly identical with *Epiactis*, and is here included in that genus, with its two species, *G. vas* and *G. bursa*. Moreover, the sub-family seems to have been erected as a result of laying too much stress upon some apparently trivial characters, especially connected with the actinopharynx. It is hard to find any justification for such a sub-family, and it is not adopted here. The other genus erected, *Glyphostylum*, seems more worthy of distinction, and although its separateness is not very marked it is defined above, provisionally at any rate.

*ANTHEOMORPHE* (Hertw., 1882, p. 30) seems barely if at all distinguishable from *Gyrostoma*.

*COMACTIS*. *C. flagellifera*, Hertw., 1882, p. 32, might be almost anything. Dana's is probably *Anemonia sulcata*.

*POLYSTOMIDIUM* (Hertw., 1882, p. 67) can hardly stand. The stomidia seem to be the remains of torn-off tentacles and the oesophageal openings probably ruptures (I have seen the specimen). Of what genus it is a battered representative is another matter.

*ILYANTHOPSIS* (Hertw., 1888, p. 13) has to lapse. *I. longifilis*, Hertw., is probably a *Condylactis*, and *I. elegans*, Wass., is a *Synhalcurias* (see p. 260). Pax refers to *I. longifilis* in his 1910 paper, pp. 171, 173, &c., as probably *C. passiflora*.

*MYRIACTIS* (Haddon, 1888, p. 248) is not easily allocated. It may be a *Stichodactyline* like *Radianthus*, or it may stand among the *Actiniidae* near *Condylactis*, but there are not quite enough data to make a certainty of it.

*GYRACTIS* (Boveri, 1893, p. 246) (see Haddon, 1898, p. 445) is very near *Bunodactis*, if not absolutely identical with it. The fact that it has no directives or siphonoglyphes cannot keep it apart, these things are too much matters of specific or individual idiosyncrasy. The doubt about



definitely fusing it up with *Bunodactis* is that the existence of regular vertical rows of verrucae seems uncertain, although both verrucae and acrorhagi are present. Regular vertical rows are extremely characteristic of *Bunodactis*, but otherwise *Gyractis* has the organization of that genus.

*TEALIOPSIS polaris*, Dan., and *KYLINDROSACTIS elegans*, Dan., are, according to Carlgren's examination of the original specimens, identical with *Stomphia*. *MADONIACTIS lofotensis*, Dan., seems to be a name covering *Tealia*, *Metridium*, and *Hormathia*, and is invalid.

Family 5. ALICIIDAE, sens. strict.

Aliciidae. Duerden + Phyllactidae, Andres, as used by Haddon, 1898, pp. 433 and 435, both pro parte.

Endomyaria with definite base and more or less delicate tissues. The column may be divided into a scapus with vesicles and a smooth capitulum; or the scapus may be smooth and the vesicles occur where it joins the capitulum, and somewhat higher up as well in some cases. The form may be very changeable. Tentacles simple, variable, may be long, their longitudinal musculature ectodermal. Ectodermal longitudinal muscle may be present in actinopharynx and capitulum, also spirocysts at least in the latter. Sphincter absent or feeble endodermal diffuse. Not more than one tentacle to each exo- and endocoel. Mesenteries NOT divided into macro- and microcnemes. Only six pairs of mesenteries perfect.

Genera: *Alicia*, *Phyllodiscus*.

*ALICIA*, Johns., 1861.

*Cladaectis*, Panc., 1868, not *Cladaectis*, Verr., 1868.

Aliciidae with delicate column capable of elongation, and divided into scapus and capitulum. The scapus bears vesicles, varying in form and in detail, but at least some of which are compound and stalked. Capitulum naked, may have weak longitudinal muscle and spirocysts in its ectoderm; the muscle may also be present in the actinopharynx. The vesicles have numerous sting-cells, which may be very large. Margin may be tentaculate. Tentacles typically long and slender, retractile. The six pairs of perfect mesenteries may be sterile. Retractors not strong, diffuse. Sphincter absent or weak diffuse.

## Species :

- A. mirabilis*, Johns., 1861, p. 303. (See Duerden, 1897,  
*A. costae*, Panc., 1868, p. 30. (See Duerden, 1895, p. 213.)  
*A. sansibarensis*, Carlgr., 1900, p. 28.  
*A. rhadina*, H. and S., 1893, p. 127, Haddon, 1898, p. 433.  
 And probably others.

PHYLLODISCUS, Kwiet., 1898, p. 407. (See Part II, Text-fig. 18.)  
*Hoplophoria* as used by Haddon (1898, p. 438) for  
*H. cincta*, not as used by Wilson for *H. coralligens*  
 (1890, p. 379).

Aliciidae in which the lower part of the body or scapus is smooth ; at its junction with the upper part or capitulum, which may be delicate and extensile, there is at least one ring of stalked vesicles ; there may be one ring of about six vesicles only, or one complete ring containing a good many more than that, and a few outside and above the ring ; or there may be several series of them, formed by one vesicle communicating with each of the older endocoels, four or more with each of the younger endocoels and the exocoels. Form of vesicles variable as to detail, more or less compound. Capitulum may have ectodermal longitudinal muscle, its margin tentaculate. The six pairs of perfect mesenteries may be sterile. Retractors weak diffuse. Sphincter absent or weak diffuse. At their best the vesicles form a wide frill or ruff round the body (see Part II, Text-figs. 18 and 2 A).

## Species :

- P. semoni*, Kwiet., 1898, p. 407.  
*P. cincta*, H. and S., 1893, p. 127 ; Haddon, 1898, p. 438.  
*P. indicus*, n. sp.

I am uniting under this genus (erected by Kwietniewski for *P. semoni*) three species. One is the *Hoplophoria cincta* of Haddon and Shackleton, which is a quite distinct form, but does not agree with the type of the genus *Hoplophoria*. That type, *H. coralligens*, Wilson, is taken by Duerden (see 1898, p. 456, and 1902) to be a *Lebrunia*. *H. cincta* does, however, fit in as a *Phyllodiscus*, possibly an immature one. The third species is a new one which I have from the Maldivé Islands (out of a collection kindly lent me by Professor Stanley Gardiner), and which, though perhaps not fully developed, is much further on than *P. cincta*, and forms a link between that and *P. semoni*.

It seems not unlikely that *Phyllodiscus* is identical with *Triactis*, but it would be well to wait for the anatomy of *T. producta* before assuming that and changing the name. A species which might possibly come in here is the one described by Hargitt as *Cradactis variabilis*.

Family 6. PHYLLACTIDAE, sens. strict.

Phyllactidae, Andres + Aliciidae, Duerden + Dendromeliidae, McM., as used by Haddon, 1898, pp. 435, 433, 440, all pro parte. Including Thaumactiniac, Fowler.

Endomyaria with definite base. Body-wall variable; it may be wide and provided with vesicles below, narrower and naked above; or there may be vesicles all over it, with or without acrorhagi at the margin; or the lower part of the body may be devoid of vesicles, and provided only with verrucae, while the vesicles are confined to the sub-marginal zone, really representing foliose acrorhagi, and sometimes forming a very definite collar or ruff; or again, the sub-marginal region may bear only about six vesicles or 'pseudotentacles', which at their best form large branching bush-like structures. In spite of this variation vesicles are always present, and both they and any acrorhagi there may be can be simple or compound. Tentacles simple, provided with sphincters in one genus only; so that usually they are non-deciduous; their longitudinal musculature ectodermal or mesogloal. There may be ectodermal longitudinal muscle in body-wall and actinopharynx. Mesenteries not divided into macro- and microenemes, more than six pairs, and usually twelve or more pairs perfect, with occasional exceptional individuals. Sphincter absent, diffuse, or circumscribed.

Genera: *Phyllactis*. *Cradactis*. *Phymactis*,  
*Cystiactis*, *Bunodeopsis*. *Thaumactis*, *Lebrunia*.

This family and its contained genera present a good deal of difficulty. I have attempted a revision of them, but it may need carrying a good deal further in the light of new knowledge. A number of genera have been described under Phyllactidae, Aliciidae, Bunodidae, Dendromeliidae, and Thaumactidae, which need a good deal of sorting out. The principle upon which one must work, of having two families (Aliciidae and Phyllactidae) was introduced in Part II, p. 530, and the

Aliciidae, sens. strict., have been dealt with above. There remains the set of forms now to be called Phyllactidae. To begin with, one suspects that names have been needlessly multiplied, and the mass of forms seems to present seven good genera, with some synonyms. Of these seven, one can say that they exhibit the same general grade of structure as the Actiniidae, but with vesicles added; but beyond that there are differences and one notes five sets of them. At least two of these sets are the logical outcome along slightly different lines of a further development of Actiniid forms, and may be looked upon as a natural family representing a stage further than the Actiniidae. In one of these sets (*Phyllactis* and *Cradactis*) the acrorhagi of some Actiniid ancestor seem to have developed complications so as to form a sort of ruff, while the verrucae remained the same; in the other set (*Cystiactis*, *Phymactis*) the verrucae have developed into vesicles, and sometimes there are acrorhagi as well. In connexion with the first set, it is interesting to note that one gets, now and then, an abnormal individual of *Actinia equina* in which some of the acrorhagi have become compound, in just such a way as one would expect a beginning to be made in the *Phyllactis* direction.

It is when we come to the other genera that the chief difficulty arises. *Thaumactis* is a small, possibly a young form, of uncertain affinities. *Bunodeopsis* is very distinct and is now, thanks to Duerden, a well-studied genus; but it is possible to think of it on the one hand as an Aliciid (sens. strict.) which can develop more than six pairs of perfect mesenteries, or on the other as the outcome of an Actiniid which has developed along a line all its own—the ancestor being, even, a pre-Actiniid *Boloceroïdes*-like form. *Lebrunia* could well enough be derived from some Actiniid or pre-Actiniid in a special way. Taking them as a whole, all these forms might be derived from forms like Actiniidae or pre-Actiniidae, the suggestion of Aliciid origin only coming in strongly in the case of *Bunodeopsis*. Since we can never know their exact history, and since it seems reasonable to think

of them diverging along different lines from somewhere near the same place, it is probably best to include them all in one family, the Phyllactidae. It will show a good deal of range as to detail, but with the fundamentals in common.

An extended discussion of other families which have been involved near Phyllactidae seems hardly necessary. It was pointed out in Part II (p. 530) that Dendromeliidae and Thaumnaetidae could hardly be upheld. Any inclusion of vesicled genera like *Bunodosoma* in the Bunodidae seems to have been a mistake. Some genera here placed in Phyllactidae were referred to Aliciidae before, but the revised sense in which the families are here taken necessitates an alteration.

PHYLLACTIS, M. Edw. and H., 1851.

*Oulaetis*, M. Edw. and H., 1851; *Asteractis*, Verr., 1868; *Lophactis*, Verr., 1868; ? *Actinostella*, Duch., 1850.

Phyllactidae. Column may be capable of a good deal of elongation; it has verrucae which usually occur in vertical rows and may attach foreign bodies to themselves. Above the verrucae and below the margin proper there is a very definite ruff, frill, or collar, which may be quite wide and conspicuous, and is formed of a number of radiating series of vesicles separated from each other by grooves, and which apparently represent complicated and extended acrorhagi; the whole ruff is separated from the tentacles by a fosse; the detail of the acrorhagi or 'fronds' varies in different cases. Sphincter usually circumscribed, more or less, not very strong, but it may be diffuse. Tentacular longitudinal muscle ectodermal. Retractors typically strong, diffuse to circumscribed diffuse.

Species:

*P. praetexta*, Dana, 1849, p. 150. (See McMurrich, 1905 on D. and M. Actinians.)

*P. flosculifera*, Les., 1817. (See McMurrich, 1889 ('Journ. Morph.');

1889 (Bermudas.) (*P. fasciculata*, McM., 1889 (Bermudas), p. 108.)

*P. conchilega*, D. and M., 1860. (? *P. expansa*, Duerden, 1898, p. 455.) (See Pax, 1910, p. 194; McMurrich, 1905; Duerden, 1898, p. 455, and 1902.) (*P. foliosa*, Andres, 1883, p. 505.)

*P. bradleyi*, Verr., 1868, p. 465; 1899.

*P. concinnata*, Dana, 1846, p. 152. (See Pax, 1912, p. v. 12.)

*P. radiata*, D. and M., 1860. (See McMurrich, 1905.)

*P. californica*, McM., 1893, p. 196.

And probably others.

I have done the best I can with this genus, but the synonymy of its species is a matter for special study. I think McMurrich has made it clear that *Phyllactis* is identical with *Oulactis*, *Asteractis*, and *Lophactis*—probably also with *Actinostella*, in which case the latter name would have priority; but until more is known of the type, *A. formosa*, it seems better to keep to the well-known *Phyllactis*. *P. striata*, Wass., seems more like a *Cradactis*.

*CRADACTIS*, McM., 1893, p. 197.

*Saccactis*, Lager, 1911, p. 220.

Phyllactidae in which the column has verrucae, usually in vertical rows, to which foreign bodies may adhere. At the margin there are vesicles in a ring—probably modified and developed acrorhagi; they vary in form, the uppermost at least being somewhat lobed or branched or foliose, and there may be concentrations of nematocysts on them; when these ‘fronds’ are at their best development they may form a wide frill round the animal. Sphincter diffuse or circumscribed, usually well developed. Longitudinal musculature of tentacles ectodermal. Retractors usually strong, diffuse to circumscribed diffuse. Gonads may or may not appear from the first cycle onwards.

Species:

*C. digitata*, McM., 1893, p. 198.

*C. plicatus*, Hutton, 1878. (See Stuckey, 1909, p. 392.)

*C. magna*, Stuckey, 1909, p. 394.

*C. memurricchi*, Lager, 1911, p. 220.

*C. australis*, Lager, 1911, p. 223.

*C. muscosa*, Lager, 1911, p. 223.

*C. excelsa*, Wass., 1908, p. 23.

? *C. striata*, Wass., 1908, p. 22.

I have joined this genus and *Saccactis* because I cannot find any very serviceable distinction between them, and I think any variation there may be in the form of the vesicles and their continuity with the rows of verrucae probably finds a parallel in *Bunodactis*, as do also the variability of nematocysts in the fronds and the variations of the sphincter. *Cradactis*



seems distinct from *Phyllactis* in that, apparently, the fronds or acrorhagi have not attained such clear distinction from the rest of the column as in that genus, where they make such a very definite zone or ruff. *C. variabilis*, Hargitt (1911, p. 51), seems of rather uncertain standing—it may come here, or, possibly, under *Phyllo-discus*.

PHYMACTIS, M. Edw., 1857.

*Rivetia*, Pax, 1912, p. D.5; *Bunodosoma*, Verr., 1899; *Eucladactis*, Verr., 1899, p. 49.

Phyllactidae in which the column is covered thickly with vesicles, which may be quite without arrangement, or may form more or less definite vertical rows, and sometimes the rows are of different sizes in a regular way according to mesentery cycles. The vesicles may be simple or more or less compound, and sometimes they fuse inseparably with each other. Acrorhagi, which may be compound, may be present (not always), being sometimes well developed and at others hardly distinguishable, within the same species. Above the acrorhagi a fosse. Sphincter weak or strong diffuse, circumscribed diffuse, or small to moderate circumscribed. Tentacular longitudinal muscle ectodermal. Retractors diffuse, weak or well developed, or stronger and circumscribed diffuse. The older mesenteries may be sterile, or most mesenteries may be fertile. There may be more than two siphonoglyphes, which need not correspond to directives—the latter may be absent.

Species:

- P. clematis*, Drayton in Dana, 1846, Syn. p. 6. (*P. florida*, Dana, 1849.) (See Carlgren, 1899, p. 17; McMurrich, 1904; Stephenson, 1918 A, p. 23.)
- P. granulifera*, Les., 1817, p. 173. (*Bunodes taeniatus*, McM., 1889, p. 23.) (See Pax, 1910, p. 184; McMurrich, 1889 ('Journ. Morph.'), p. 23; Duerden, 1902, p. 348.)
- P. sphaerulata*, Duerden, 1902, p. 350.
- P. kükenthali*, Pax, 1910, p. 189.
- P. papillosa*, Les., 1830, p. 78. (See Pax, 1912, p. D. 6.)
- P. grandis*, Verr., 1868, p. 473; 1899, p. 49.

I have included Verrill's *Eucladactis grandis* with some hesitation in this genus, following McMurrich. It seems to have almost enough to merit distinction in its very definite cyclic rows of vesicles, rather comparable to the verrucae of *Bunodactis gemmacea* in arrangement—but there are

at any rate tendencies in this direction in other species (cf. *P. sphaerulata*), and I leave it at that for the time being. I think my fusion of *Bunodosoma* with *Rivetia* and *Phymactis* can be supported in the same sort of way as Torrey's fusion of *Bunodactis* with *Anthopleura*, &c. It has been seen from time to time that sphincter-detail alone cannot always separate species; that acrorhagi are too variable (cf. *P. granulifera* in which they may be well developed or barely discernible) to be invariable ground for separation; and there do not in this case seem to be any valid distinctions to be based on the vesicles. The siphonoglyphe-variation and lack of directives in *P. (Rivetia) papillosa* has parallels elsewhere, and is hardly in itself of generic weight.

*CYSTIACTIS*, M. Edw., 1857. (See Haddon and Duerden, 1896, p. 154.)

*Phlyctenactis*, Stuckey, 1909, p. 396.

Phyllactidae with the column covered by simple sessile or slightly pedunculate vesicles. No acrorhagi. Longitudinal musculature of tentacles mesogloal. Sphincter absent or diffuse. Primary mesenteries may be sterile. Retractors diffuse.

Species:

*C. tuberculosa*, Q. and G., 1833, p. 159. (See Haddon and Duerden, 1896, p. 156; Lager, 1911.)

*C. retifera*, Stuckey, 1909, p. 396.

*C. morrisoni*, Stuckey, 1909, p. 396.

?*C. Koellikeri*, Pax, 1910, p. 180.

And other older species not yet well known.

I have placed Stuckey's *Phlyctenactis* under *Cystiactis*, with which it seems to be identical, especially if the tentacular muscle is mesogloal, as his figures lead one to believe. *C. Koellikeri* may belong here or under *Phymactis*. *Cystiactis* is distinguished from *Phymactis* by its simple vesicles, constant absence of acrorhagi, mesogloal tentacle-muscle, and on the whole weaker musculature.

*BUNODEOPSIS*, Andres, 1880. (See Duerden, 1897 and 1902.)

Phyllactidae with the body broad and flattish below, covered with

vesicles; narrower and devoid of vesicles above, thus having a smooth extensile capitulum. The capitulum has a tentaculate margin, and both it and the long tentacles are retractile. The latter have little stinging spots on them, and moreover each has a sphincter at its base, as in *Bolocera*, so that it is deciduous. The vesicles may be simple and sphaeroidal or compound, sessile or stalked, and have nematocysts in at least parts of their ectoderm. Tentacular longitudinal muscle ectodermal. There is ectodermal longitudinal muscle in body-wall and actinopharynx, and there are no siphonoglyphes; but the mesenterial filaments have ciliated tracts as usual. Sphincter absent or weak diffuse. Number of perfect mesenteries variable, about four to twenty pairs, the irregularity probably connected with fission and laceration as modes of reproduction. Retractors diffuse. Tissues delicate. Habitat. weeds, stones, &c.

## Species:

*B. strumosa*, Andres, 1880, p. 315. (See Duerden, 1897 and 1902, 'Trans. Linn. Soc.')

*B. antillifera*, Duerden, 1897, p. 7; 1902, 'Trans. Linn. Soc.'

*B. globulifera*, Verr., 'Trans. Connect. Acad.', x, p. 559. (See Duerden, 1902.)

? *B. australis*, Haddon, 1898, p. 435.

*B. australis* may not really be a *Bunodeopsis*; its anatomy is unknown and it has only a single circle of vesicles near the base, and does not seem quite like the others. *Viatrix globulifera*, D. and M., is perhaps the same as *B. globulifera*.

## THAUMACTIS, Fowler, 1889, p. 143.

Phyllactidae probably. Only described species a small form flattened like a disc, with the mouth in the middle of the upper side; perhaps free-swimming. The column has irregularly arranged simple or slightly compound vesicles. There are a few marginal tentacles, with ectodermal longitudinal musculature. Body-wall and actinopharynx have ectodermal longitudinal musculature. No siphonoglyphes. Weak diffuse sphincter. Mesenteries not numerous, with weak musculature.

## Species:

*T. medusioides*, Fowler, 1889, p. 143.

## LEBRUNIA, D. and M., 1860.

Probably *Hoplophoria* as used by Wilson, 1890, p. 379, for *H. coralligena*, not as used by Haddon, 1898, p. 438, for *H. cincta*.

Phyllactidae with no marginal acrorhagi or fosse, but with six, or four to eight hollow outgrowths just below the margin, these at best forming large and complicated bunches or 'pseudotentacles'. They vary as to detail, but are dichotomous in their early branchings; there is usually some development of nematocysts on them, these latter being sometimes definitely concentrated into acrorhagi on the pseudotentacles, which may differ in colour from the rest of the pseudotentacles. No sphincter. Tentacles not retractile. Retractors diffuse. Mesenteries may be all fertile, save perhaps the directives.

Species :

*L. danae*, D. and M., 1860, p. 47. (See Pax, 1910, p. 209; McMurrich, 1889, 'Journ. Morph.', p. 31, &c.; Verrill, 'Trans. Connect. Acad.', x; Verrill, 1899; McMurrich, 1905.)

*L. neglecta*, D. and M., 1860, p. 48. (See same references as for *L. danae*.)

*L. coralligens*, Wilson, 1890, p. 379. (See Haddon, 1898, p. 437, and Duerden, 1898, p. 456, and 1902.)

Verrill considers *L. danae* and *L. neglecta* distinct species because of the acrorhagi on the fronds of *danae*; McMurrich seems to think they run into each other. Duerden thinks that *Hoplophoria coralligens* is a *Lebrunia*.

#### Family 7. MINYADIDAE, sens. strict.

Minyadidae, Andres, as used by Haddon, 1898, p. 463.

Endomyaria (?) in which the base forms a float. It is hollowed out and has in-drawn edges with only a slight opening, the cavity being filled by a chitinous mass which is porous and exhibits a more or less definite structure. The body is smooth in the one form best known; it has forty tentacles, one siphonoglyphe, ten pairs of perfect mesenteries with strong circumscribed to circumscribed-diffuse retractors, and ten pairs of imperfect mesenteries with more diffuse retractors. The endocoels are larger than the exocoels, this giving a curious appearance to a transverse section. Not more than one tentacle to each exo- and endocoel. Sphincter endodermal—well-developed circumscribed according to Carlgren, consisting only of a single fold according to Haddon.

Genus: *Stichophora*.

STICHOPHORA, Brandt, 1835.

*S. torpedo*, Bell, 1885, p. 114. (*Minyas torpedo*.)

See above definition, and also Part II, p. 533, and Carlgren, 1894, p. 19, and Haddon, 1898, p. 465.

## Family 8. PHYMANTHIDAE.

Phymanthidae as used by Carlgren, 1900, p. 66.

Phymanthidae, Andres, as used by Duerden, 1900, p. 138.

Including Thelaceridae, Mitchell, 1890.

Endomyaria with definite but sometimes reduced and half-physa-like base, which is more usually, however, well developed. Form of body variable. Cinclides may be present. Verrucae usually present. No sphincter or only a trace. Tentacles of two sorts, marginal and discal. Marginal tentacles in cycles in the usual way, rarely smooth, usually with greater or less development of paired lateral swellings or outgrowths, which may be simple or ramified, insignificant or conspicuous. Oral disc with short papilliform or not much developed tentacles as a rule—they are occasionally absent; when present they may be connected with endocoels only, or with both endo- and exocoels. Mesenteries typically with well-developed retractors, which in the best cases are circumscribed. A good many mesenteries are perfect.

Genus: *Phymanthus*.

PHYMANTHUS, M. Edw., 1857.

*Thelaceros*, Mitchell, 1890.

Phymanthidae. Base variable, from well developed to small or reduced and capable of being half like a physa. Form of body variable—may be trumpet shaped or almost *Halcompa*-like, and so on. Cinclides may be present near the base. Upper part of body with verrucae, which may occur in vertical rows; they may attach foreign bodies; they may be insignificant. Margin crenulated or provided with acrorhagi which may even be somewhat compound; rarely no verrucae or acrorhagi; there may be a fosse. Marginal tentacles (arrangement may be hexamerous or octamerous) smooth (rarely) or provided with feebly or strongly developed lateral, usually paired, swellings, which may be merely low knobs or may amount to short ramified branches; they may meet across the oral face of the tentacle; and grades between their presence and absence are found. Discal tentacles usually sessile outgrowths of the disc; they may resemble the marginal tentacles in miniature, or may be merely papilliform, or even scarce, reduced, or absent (see Part II, Text-fig. 14, H). The whole disc may become somewhat folded. The mesenteries are a good many of them perfect, and the stronger ones have usually strong retractors, sometimes diffuse but at their best circumscribed (see Part II, Text-fig. 4, E); the older ones or all of them fertile, save sometimes the directives. Little or no sphincter. Radial musculature of disc and tentacles ectodermal or with

a mesogloea tendency. May be retractile or not. Actinopharynx and siphonoglyphes may have weak ectodermal muscle.

Species :

*P. crucifer*, Les., 1817, p. 174. (See Duerden, 1900, p. 139 ; Pax, 1910, p. 222 ; McMurrich, 'Journ. Morph.', 1889, &c.)

*P. sansibaricus*, Carlgr., 1900, p. 67.

*P. strandesi*, Carlgr., 1900, p. 68.

*P. loligo*, Ehr., 1834, p. 41. (See Carlgren, 1900, p. 70.)

*P. muscosus*, H. and S., 1893, p. 122. (See Haddon, 1898, p. 496, and Kwietniewski, 1898.)

*P. rhizophorae*, Mitchell, 1890, p. 557.

*P. levis*, Kwiet., 1898, p. 421.

? *P. caeruleus*, Q. and G., 1833, p. 157. (See Pax, 1912, p. 312.)

And perhaps others.

*Phymanthus* is an easily identified genus, and interesting as giving hints as to its evolution in the species which verge in structure in the direction of *Haleampa*. The genus *Crambactis* of Haeckel is invalid; Carlgren states that the queer inner tentacles were only extruded filaments (1900, p. 58).

#### Family 9. HETERANTHIDAE, Carlgr.

Heteranthidae, Carlgr., 1900, p. 72, 1900 ('Öfv. Vet.-Akad. Förh.'), p. 278.

Rhodactidae, Andres, as used by Haddon, 1898, p. 476, *pro parte*.

Endomyaria with definite base. The column in the only known form has verrucae and fosse, the distal margin with little warted lobes; the sphincter is not very strong, endodermal circumscribed; the tentacles are distinctly marked off into marginal and discal, the marginal short conical, the discal wart-like, in rows; the mesenterial musculature is well developed.

#### Genus: *Heteranthus*.

*HETERANTHUS*, Klunz., 1877.

*H. verruculatus*, Klunz., 1877, p. 84.

See above definition for chief characteristics. I know nothing of this family save the details here given, which are taken from Carlgren, 1900, p. 72.



## Family 10. HOMOSTICHANTHIDAE, Carlgr.

Homostichanthidae, Carlgr., 1900, p. 118.

Discosomidae as used by Duerden, 1900, p. 154, *pro parte*.

Endomyaria with definite base. The known form has smooth body but for possible aerorhagi. Sphincter not strong, circumscribed diffuse. Retractors diffuse. Tentacles all of one sort, simple, may be short and more or less papilliform, in radiating series on the exocoels as well as the endocoels. Numerous perfect mesenteries.

Genus: *Homostichanthus*.

HOMOSTICHANTHUS, Duerden, 1900, p. 166.

Homostichanthidae in which the body may be elongate, smooth; distal part may be somewhat folded. Margin with elevations, possibly aerorhagi, and slight fosse. Retractable. Tentacles short, smooth, slightly capitate, knob-like, their stems glandular and heads nematocystic, their longitudinal musculature ectodermal. Slight circumscribed-diffuse sphincter. Numerous perfect mesenteries and diffuse retractors.

Species:

*H. duerdeni*, Carlgr., 1900, p. 117. (See Duerden, 1900, p. 167.)

## Family 11. AURELIANIDAE.

Aurelianidae, Andres, as defined by Carlgren, 1900 (small paper on *Stichodactylinae*), p. 279.

Endomyaria with definite base, which may be large or small. Body may have more or less cuticle, or may have small vesicle-like verrucae below the margin. The tentacles are small vesicular outgrowths, often lobed, two or three or many communicating with each of the main exo- and endocoels. Sphincter strong circumscribed (see Part II, Text-fig. 13). Main mesenteries very strongly muscular, the retractors exhibiting at their best the extreme of circumscription and distinction from the mesenterial surface. All stronger or all mesenteries perfect and fertile. Only one siphonoglyphe. Radial musculature of disc and tentacles, such as it may be, ectodermal or mesogloal.

Genera: *Aureliania*, *Actinoporus*.

AURELIANIA, Gosse, 1860, p. 282.

Probably *Leiotecalia*, Hertw., 1882, p. 37.

Aurelianidae with a very wide base, so that the body slopes inwards more or less to the narrower disc. No verrucae. Body divided more or

less definitely (the distinction not necessarily externally clear) into an extensive scapus (to which usually adheres a roughish brown cuticle, much or little of it) and a more delicate capitulum or puffy marginal region, the ectoderm of which may contain spirocysts. Distinct fosse. The tentacles are short knobs, sometimes with stems, arranged so that two communicate with each main exocoel, and two or three with each main endocoel (see Part II, Text-fig. 14, A). Besides being in short radial rows they are so placed as to form cycles which alternate, though not in the genuine 'Actiniine' way. They are some simple, some lobed, and in a living specimen one can distinguish different tentacle-forms for the different concentric rings. Sphincter fairly to very strong, circumscribed, with a heavy central axis of mesogloea (see Part II, Text-fig. 13, B). Radial musculature of disc and tentacles where present curious, chiefly mesogloea. All stronger mesenteries perfect, fertile, with filaments and retractors; the retractors very unusual, powerfully circumscribed (see Part II, Text-fig. 4, B), and attached to the mesentery by one edge only for part of their extent, and with an axis of mesogloea. There may be additional weak mesenteries beyond the main macromesenteries.

Species :

*A. augusta*, Gosse, 1860, p. 283. (See Faurot, 1895.)

*A. heterocera*, Thompson, 1853.

*A. regalis*, Andres, 1883, p. 496. (See Carlgren, 1900, short paper on Stichodactylines, p. 279, &c.)

? *A. nymphaea*, Hertw., 1882, p. 38.

I have personally studied *A. augusta*, both alive and anatomically, and I do not know why Andres assumed it to be the same as his *A. regalis*. It is not impossible that *Capnea*, Forbes, is the young of *Aureliania*; beyond this suggestion it cannot yet be allocated. Then there is the question of Hertwig's genus *Leiotelia*. It has generally been assumed (and I shared the idea formerly) that this is identical with *Epiactis* or *Isotelia*, but this overlooks certain details of its structure. I have recently been able to investigate two species of *Aureliania*, *A. augusta* and a possibly new one, and on re-reading Hertwig's description in the light of this, it becomes evident that in all features one can be sure about the two genera really share essentials. An examination of the original Challenger specimen confirmed the idea. The one uncertain though necessary point is that it is

not known whether *Leiotetalia* has more than one tentacle to each main endocoel and exocoel or not; Hertwig apparently thought only one, but the specimen is small and so contracted (and *Aureliania* has cycles as well as radial rows) that it is hard to tell. The other things seem to point to its being an *Aureliania*, which in that case should be called *A. nymphaea*, Hertw.; whether it is *A. nymphaea*, Drayt., is another matter. It has smooth body without verrucae or acrorhagi, small button-like tentacles, pinnate sphincter with stout mesogloal axis, mesogloal radial disc-muscle; only the mesenteries of cycles 1-3 have distinct retractors, and these are great circumscribed things attached only at one edge. These things are all found in *Aureliania* (not necessarily only three cycles of mesenteries with retractors of course), as are also the wide base and pyramidal form of *nymphaea*, and some of them are very characteristic features. The sphincter is less developed in *nymphaea* than in the others. In view of the general evidence it seems probable that the *Stichodactylina* tentacle-plan may be assumed.

*ACTINOPORUS*, Duch., 1850. (See Duerden, 1900, p. 174: Carlgrén, 1900, short paper on *Stichodactylines*, p. 283.)

*Aureliania* with definite but not specially wide base—it may even be somewhat reduced. The body may be long. There may be rather vesicle-like verrucae below the sphincter, of which the main ones sometimes form a sort of collar. Deep fosse. Disc not extensive, but notched into little permanent lobes or lappets at its margin, which correspond in number to the endocoels and exocoels. Tentacles short vesicular knobs, may be lobed, many communicating with each exocoel and endocoel, the tentaculate areas thus formed separated from each other by radial grooves. Sphincter strong circumscribed (see Part II, Text-fig. 13, A). Mesenteries all perfect and all or mostly fertile, with very strong circumscribed retractors which may be broadly or narrowly attached to the mesenteries, partly according to region. Disc and tentacle muscle very weak, ectodermal if present.

Species:

*A. elegans*, Duch., 1850, p. 10. (See Duerden, 1900, p. 175.)

*A. elongatus*, Carlgr., 1900 (small paper on *Stichodactylines*), p. 283.

## Family 12. ACTINODENDRIDAE.

Actinodendridae, Haddon, 1898, p. 488; Carlgren, 1900, p. 96.

Acremodactylidae, Dendrianthidae, Kwiet., 1897-8.

Endomyaria with definite base, not always well marked off from the column, and it may be small. Smooth wall. No special margin. No sphincter or a slight diffuse one. Disc produced into permanent arm-like lobes, which are arranged in cycles like large tentacles, each bearing numerous tentacles or branches on it (see Part II, Text-fig. 14, K); these tentacles may be arranged all round the lobes or be more or less absent from parts of them, and may be themselves simple or branched, and in the latter case giving the whole arm a dendritic effect (see Part II, Text-fig. 19). Mesenteries all (or twelve pairs only perfect) perfect and fertile, except sometimes the directives, with strong retractors. Radial musculature of disc and tentacles ectodermal. There may be concentrations of nematocysts in the tentacle-lips, in little thickenings. The discal arms correspond one to each endocoel in the inner cycles, one to each exocoel in the outer, the size varying according to cycle.

Genera: Actinodendron, Actinostephanus,  
Megalactis.

ACTINODENDRON, Blainv., 1830, p. 287.

Acremodactyla, Kwiet., 1898.

Actinodendridae in which the tentacles are arranged all round the arms, and are themselves branched, and may have nematocystic thickenings at their tips. Very strong diffuse retractors. (See Part II, Text-fig. 19, for appearance of *A. plumosum*.)

Species:

*A. plumosum*, Haddon, 1898, p. 490. (See Saville Kent, 1893.)

*A. glomeratum*, Haddon, 1898, p. 492. (See Saville Kent, 1893 and 1897.)

*A. hansingorum*, Carlgr., 1900, p. 98.

*A. ambonensis*, Kwiet., 1898, p. 401. (See Carlgren, 1900, p. 96.)

And probably others.

ACTINOSTEPHANUS, Kwiet., 1898, p. 403.

Actinodendridae in which the tentacles are irregularly arranged on the arms and are simple. Strong retractors.

Species:

*A. haeckeli*, Kwiet., 1898, p. 403.

## MEGALACTIS, Ehr., 1834.

Actinodendridae with the arms longer than in *Actinodendron*, the oral faces of the arms freer from tentacles, the ultimate branches of the tentacles simple and pointed, not bifid. (See Part II, Text-fig. 14, κ.)

Species :

*M. griffithsii*, Saville Kent, 1893, pp. 35, 147. (See Haddon, 1898, p. 493.)

And probably at least one other.

I have followed Haddon and Saville Kent in keeping *Megalactis* separate from *Actinodendron*, as I think it should be, although not yet well known.

## Family 13. THALASSIANTHIDAE.

Thalassianthidae, McM., as used by Haddon, 1898, p. 482, and Carlgren, 1900, p. 86.

Endomyaria with definite base. Body with or without verrucae above. Disc circular or waved or puckered. Not more than one dendritic tentacle to each exocoel—exocoelic tentacles all dendritic. Several simple or dendritic tentacles and several (sometimes many) modified tentacles or nematospheres on many of the endocoels, these sometimes gathered up on to a definite permanent elevation or even finger-like lobe of the disc (the nematospheres being aboral), which may cover an endocoel and the two adjacent exocoels. Sphincter of variable development, from more diffuse to more circumscribed, not very strong. Mesenterial musculature well developed, but not unusually strong, retractors more or less diffuse. Numerous perfect mesenteries.

Genera: *Thalassianthus*, *Cryptodendron*,  
*Actinaria*.

## THALASSIANTHUS, Leuck., 1828.

*Heterodactyla*. Ehr., 1834.

Thalassianthidae with verrucae above, which may be in rows, or with none, and they may vary in distinctness. Margin may be distinct or notched. Disc may be folded or puckered up, or not. Marginal tentacles dendritic, without nematospheres, not more than one per exocoel. The endocoelic tentacles are also dendritic, but many of them arranged on elevations or permanent lobes of the disc, and occupying the more oral part of the elevation, which typically possesses aborally a bunch of grape-like stinging batteries or nematospheres (see Part II, Text-fig. 14, E). Siphonoglyphes two or several, directives present in the first case,

absent in the second. Sphincter weak to moderate, more diffuse to more circumscribed. Radial muscle of disc ectodermal. Retractors diffuse or more like circumscribed diffuse, numerous mesenteries perfect. gonads chiefly on stronger imperfects, or on the older mesenteries save sometimes the directives.

Species :

- T. aster*, Lenck. in Rüppel. 1828. p. 5. (See Carlgren, 1900, p. 87.)  
*T. kraepelini*, Carlgr., 1900, p. 91.  
*T. senckenbergianus*, Kwiet., 1897. p. 337.  
*T. hemprichi*, Ehr., 1834. p. 42. (See Carlgren, 1900, p. 94; Haddon, 1898, p. 485.)  
*T. hypnoides*, Saville Kent, 1893, p. 148. (See Haddon, 1898, p. 486.)

I have joined *Thalassianthus* and *Heterodactyla* because I cannot find any really important differences between them. The definition given covers both. The presence of several siphonoglyphes in some species, and no directives, of two siphonoglyphes and two pairs of directives in others, seems no valid ground of separation.

CRYPTODENDRON, Klunz., 1877.

Thalassianthidae with or without suckers on upper part of body, and with somewhat crenulated margin. Wide irregularly-folded disc. Three sets of tentacles : (a) a set of short exocoelic marginal dendrites ; (b) radial rows of short, simple, and dendritic tentacles on the inner part of the disc ; and (c) an intermediate zone of nematospheres. Sphincter weak to moderate, circumscribed. Well-developed diffuse retractors. The nematospheres especially have apical batteries of sting-cells and glandular stems. Radial musculature of disc and tentacles ectodermal. The nematospheres are in sessile packets, and they and the discal dendrites are endocoelic.

Species :

- C. adhaesivum*, Klunz., 1877. p. 86. (See Haddon, 1898, p. 483, and Kwietniewski, 1896.)

ACTINERIA, Blainv., 1830.

Thalassianthidae with vertical rows of verrucae in upper part of column, parapet notched a little. Wide folded disc, bare in the middle, with small permanent lobes at the edge. Exocoels with dendritic tentacles, endocoelic lobes with dendrites (which run inwards on the disc) on the oral side and a mass of nematospheres aborally. Sphincter



not very strong, sessile circumscribed. Numerous perfect mesenteries. Older mesenteries fertile, but probably not the directives.

Species :

*A. dendrophora*, H. and S., 1893, p. 123; Haddon, 1898, p. 487.

And probably also *A. villosa*, Q. and G., 1833, p. 156.

#### Family 14. STOICHACTIDAE.

Stoichactidae, Carlgr., 1900, p. 72; 1900 ('Öfv. Vet.-Akad. Förh. '), p. 278.

Discosomidae. Klunz., as used by Haddon, 1898, p. 469, *pro parte*.

Endomyaria with definite base. Column usually but not always verrucose above. Size sometimes very large. Tentacles simple, but for scattered bifid or multifid tentacles which sometimes occur sporadically among the others; they may be fairly long and quite ordinary, or may be short or wart-like, or even short columns with spherical heads. They are all of one sort in the same animal, and there is not more than one to each exocoel; the endocoels may in rare cases have only one tentacle each, but usually at least some of them have more—the stronger ones may have radial rows (see Part II, Text-fig. 14, F), or all the endocoels may have either one or several rows. Sphincter strong or not very strong, more or less diffuse to more or less circumscribed. Mesenterial musculature well developed, retractors weaker or stronger but not unusually strong, diffuse. Numerous perfect mesenteries. Gonads may occur on all mesenteries—usually the older ones are fertile save sometimes the directives, but not always. Tentacular longitudinal muscle ectodermal.

Genera: *Stoichactis*, *Radianthus*, *Antheopsis*.

This family is itself very clearly marked off from others, but within it, it is difficult to satisfactorily separate off genera. The difficulty is increased because some descriptions of the forms do not give enough data. At best, it seems that there are only three sound genera to be distinguished, three stages in the evolution of very similar creatures; they form a series really, and I do not feel perfectly confident that they do not all form one large genus. At any rate more than three it is unwise to insist on; some pairs of names have been given to similar forms, and some of these must now become synonyms.

In *Antheopsis* (= *Stichodactis*) the condition is sometimes purely 'Actiniine'—not more than one tentacle to each exo- and endocoel; but the more normal state is for there to be more than one tentacle; or a row, on the older endocoels but not the younger.

In *Radianthus* (= *Helianthopsis*) comes the stage where all the endocoels have radial rows, but there is only about one row on each. In *Stoichactis* (= *Discosomoides*) the last stage is attained, and there are not only radial groups on all the endocoels, but usually more than one row abreast in each group; and the tentacles have often specialized in small size. As far as sphincters are concerned, I think comparison with other families will show that their exact form cannot be used here as a generic distinction. In the lists of species given below it should be remembered that a form here and there may be allocated to the wrong genus because of insufficient data about it; but some re-arrangement has been made intentionally to get the three grades clearly separated off. The readjustments mainly mean a transference to *Antheopsis* of some forms originally described under *Radianthus*, *Stichodactis*, and *Helianthopsis*, and a consequent depletion of the true genus *Radianthus*. This has been necessary to get together all the forms with radial rows of tentacles on the older endocoels only. It is not much of a distinction, but if the two genera are to be kept apart at all it must be insisted on. That the sporadic occurrence of a few cleft tentacles in some species should be used as a generic character would be a mistake.

*STOICHACTIS*, Haddon, 1898, p. 472.

*Discosomoides*, Haddon, 1898, p. 470.

*Stoichactidae*. Some species attain enormous size, up to about two feet across, and often crustacea or fish are commensal with them. The body is usually wider above than below, and above with suckers which may be in vertical rows—these may, however, be rudimentary or absent, present or not even in the same species. Margin barely or slightly or distinctly marked, may be notched. Disc simple or little or much folded. Tentacles not very long at best, usually short or very short; digitiform

or subulate; or wart-like: or wider at the tip than at the base; or forming short stems with spherical heads. Only one tentacle per exocoel, a good many on each endocoel, usually more than one row abreast per endocoel; the rows may be very irregular. Sphincter weaker or stronger, circumscribed diffuse to well circumscribed. A cleft tentacle sometimes occurs among the others. Siphonoglyphes and directives variable in number.

## Species:

- S. kenti*, H. and S., 1893, p. 119. (See Saville Kent, 1893, p. 144; Haddon, 1898, p. 473.)  
*S. haddoni*, Saville Kent, 1893, pp. 32, 144. (See Haddon, 1898, p. 474.)  
*S. helianthus*, Ellis, 1767, p. 436. (*S. anemone*, Ellis, 1767, p. 436.) (See Duerden, 1900, p. 162; Pax, 1910, p. 227; McMurrich, 'Journ. Morph.', 1889.)  
*S. ambonensis*, Kwiet., 1898, p. 410.  
*S. tuberculata*, Kwiet., 1898, p. 412.  
*S. giganteum*, Forsk., 1775, p. 100. (See Carlgren, 1900, p. 77.)  
*S. tapetum*, Ehr., 1834, p. 32. (See Carlgren, 1900, p. 74.)  
*S. laevis*, Lager, 1911, p. 240.  
*S. intermedia*, Lager, 1911, p. 238.  
*S. australis*, Lager, 1911, p. 241.  
*S. fuegiensis*, Dana, 1846. (See McMurrich, 1893, p. 200.)

## RADIANTHUS, Kwiet., 1897, p. 331.

*Helianthopsis*, Kwiet., 1898, p. 417, pro parte.

Stoichactidae with or without suckers on upper part of body. Margin fairly well marked. Tentacles shorter or longer, but not mere papillae. More than one tentacle communicates with every endocoel (not more than one per exocoel), but only about one row on each. Here and there may be cleft tentacles. The disc may be lobed. Sphincter more or less diffuse to weak or medium circumscribed.

## Species:

- R. lobatus*, Kwiet., 1898, p. 414.  
*R. mabrucki*, Carlgren, 1900, p. 82.  
 ? *R. parvitentaculatus*, Q. and G., 1833, p. 165. (See Pax, 1912, p. 314.)

## ANTHEOPSIS, Simon, 1892.

*Stichodactis*, Kwiet., 1898, p. 415.

*Radianthus*, Kwiet., 1897, p. 331, pro parte.

*Helianthopsis*, Kwiet., 1898, p. 417, pro parte.

Stoichactidae with suckers in the upper part of the body or not: if

they are there foreign bodies may adhere to them ; margin distinct, may be crenulated. Disc circular or more or less lobed. Tentacles shorter or longer, may attain good length ; at any rate not mere papillae. Not more than one tentacle per exocoel. As to the endocoels (see Part II. Text-fig. 14. F), there are never radial rows on all of them ; usually there are radial rows on the older ones or some of them, but these vary in length—the larger ones may contain a good many tentacles or only a few ; the rows are more or less single, and sometimes they are quite absent so that the form is not 'Stichodactylinae' as to tentacles at all, having only one per endocoel. Cleft tentacles may occur here and there among the others. Sphincter weak or moderate, diffuse, circumscribed diffuse, or circumscribed. Number of siphonoglyphes and directives variable.

Species :

- A. koseirensis*, Klunz., 1877, p. 77. (See Simon, 1892, and Carlgren, 1900, p. 85.)
- A. ritteri*, Kwiet., 1898, p. 417. (See Carlgren, 1900, p. 81.)
- A. kuekenthalii*, Kwiet., 1897, p. 332.
- A. papillosa*, Kwiet., 1898, p. 415.
- A. macrodactylus*, H. and S., 1893, p. 120 ; Haddon, 1898, p. 471.
- A. malu*, H. and S., 1893, p. 120 ; Haddon, 1898, p. 472.
- A. carlgreni*, Lager, 1911, p. 243.
- A. concinnata*, Lager, 1911, p. 244.
- A. glandulosa*, Lager, 1911, p. 246.
- A. kwietniewskii*, Lager, 1911, p. 247.

### Sub-order MADREPORARIA.

I do not wish to suggest, even vaguely, to which of the skeleton-forming corals the genera defined below are related. The ground for placing them under Madreporaria will be found in Part II, p. 510. To save repetitions, a general statement covering Corallimorphidae and Discosomidae is given first, but it is not meant as the definition of a sub-tribe, although it would serve that purpose if such a sub-tribe were needed.

Madreporaria which secrete no definite skeleton. They may live quite a solitary life, or may live together in numbers. They frequently reproduce by fission, and compound individuals with several mouths may be found, or individuals connected by a coenosare. There is a definite base. The body is smooth, and variable in form and consistency. The

tentacles are arranged so that more than one communicates with some at least of the endocoels, and sometimes more than one with exocoels also; they may be simple, knobbed, or branched, and so on, and there may be more than one sort in the same species; they may be reduced and wart-like (Part II, Text-fig. 3), or even reduced to nothing externally visible. There are typically no siphonoglyphes—these are recorded in some cases but their existence probably needs confirming. The mesenterial filaments have no ciliated tracts. Sphincters are absent or weak diffuse. Sting-cells of a size characteristic more of Madreporaria than of Actiniaria are usually present somewhere in the body (see Part II, Text-fig. 6). There are usually a good many perfect mesenteries, as a rule twelve or more pairs, and there is no distinction of them into macro- and microenemes. The longitudinal mesenterial musculature consists typically of a feeble layer, not forming the sort of sheet or retractor characteristic of Actiniaria (see Part II, Text-figs. 4 and 5). Basilar muscles are absent. Ectodermal muscle present at least sometimes in the body-wall, sometimes probably absent. Directives usually present, varying in number. The large sting-cells may occur in tentacles, actinopharynx, mesenteries, body-wall.

#### Family 1. CORALLIMORPHIDAE.

Corallimorphidae, Hertw., 1882, p. 21; Carlgr., 1900, p. 19.

Size larger or smaller; habit solitary or gregarious, individuals may be connected by coenosare. Ectodermal muscle in body-wall present at least in some cases. Tentacles simple, knobbed at the tips. Not more than one tentacle per exocoel, more than one on at least the older endocoels.

Genera: *Corallimorphus*, *Isocorallion*,  
*Corynactis*.

*CORALLIMORPHUS*, Moseley, 1877, p. 299.

Corallimorphidae with weak musculature throughout. Body-wall ectoderm has weak longitudinal musculature. No sphincter. Body-wall and oral disc may be very thick and cartilaginous, and animal may attain fairly large size. Tentacles simple, and all knobbed at the tip (see Part II, Text-fig. 14, a), divided into two sorts, marginal and discal. There is never more than one tentacle of each sort arising from one and the same endocoel. The exocoelic tentacles are the smallest of the marginal series, taken on the whole, and the discal tentacles correspond to the endocoels of the inner marginal tentacles. There may be a good deal of irregularity.

## Species :

- C. rigidus*, Moseley, 1877, p. 301. (See Hertwig, 1882, p. 23, and 1888, pp. 9, 10; Stephenson, 1920 B, p. 178.)  
*C. profundus*, Moseley, 1877, p. 300. (See Hertwig, 1882, p. 28, and 1888, pp. 9, 10; Stephenson, 1920 B, p. 178.)  
*C. obtectus*, Hertw., 1888, p. 9. (See Stephenson, 1920 B, p. 178.)  
*C. ingens*, Gravier, 1918, p. 23.

The above definition of the genus is practically that given in my short note on the genus *Corallimorphus* ('Proc. R. I. Acad.', 1920, B, 9). I began it there with the words 'Stichodactylinae Actiniaria', this being provisional, as I had not then worked out my idea of its being a skeleton-less coral fully enough for publication. I have listed the four species here for reference purposes, but as before suggested, I am inclined to think they are all one, and the more so since dealing with another specimen from an Antarctic collection and looking at the Challenger specimens. *C. ingens* is probably the same as the others. If the four listed are to be separate, my Irish form would make a fifth.

ISOCORALLION, Carlgr., 1900, p. 19.

*Chalmersia*, Del. and Hér., 1901, p. 536.

*Corynactis* as used by Hertwig for *Corynactis*, sp., 1888, p. 10.

*Corallimorphidae* differing from *Corallimorphus* in having the ectodermal muscle in the body-wall stronger, and with normally two disc-tentacles on each of the oldest radii of the disc.

## Species :

- I. hertwigi*, Carlgr., 1900, p. 19. (See Hertwig, 1888, p. 10. *Corynactis*, sp.)

I feel doubtful of the distinctness of this genus from *Corallimorphus*, but hardly enough is yet known of it to justify their fusion.

CORYNACTIS, Allm., 1846. (See Duerden, 1898, p. 635, &c.)

*Corallimorphidae* of small size, often gregarious in habit, sometimes forming large sheets of individuals; often clusters or pairs of individuals are found attached to each other by a basal coenosarc; fission is a usual



method of increase. The individuals are very variable in form, often trumpet shaped in expansion, and more or less retractile. The tentacles are knobbed, the outer larger than the inner, and the exocoelic tentacles largest of all. Some or all of the endocoels have more than one tentacle connected with them. Tentacle-heads usually with large sting-cells and little or no muscle, shafts with ectodermal longitudinal muscle. Perhaps very weak ectodermal muscle in the body-wall. Sphincter absent or weak diffuse.

Species :

- C. viridis*, Allm., 1846, p. 417. (See Gosse, 1860, p. 289, and Rees, 1915, p. 543.)
- C. globulifera*, Ehr., 1834, p. 39. (See Carlgren, 1900, p. 20, and Haddon, 1898, p. 467.) (? *C. hoplites*, H. and S., 1893, p. 118.)
- C. myrcia*, D. and M., 1866, p. 124. (See Duerden, 1900, p. 181.)
- C. carnea*, Studer, 1879, p. 542. (See McMurrich, 1904, and Kwietniewski, 1896.)
- C. australis*, H. and Duerden, 1896, p. 151.
- C. haddoni*, Farquhar, 1898, p. 532. (See Stuckey, 1909, p. 390.)
- C. mollis*, Farquhar, 1898, p. 534. (See Stuckey, 1909, p. 390.)
- C. gracilis*, Farquhar, 1898, p. 534. (See Stuckey, 1909, p. 390.)
- C. albida*, Stuckey, 1909, p. 390.

And perhaps others.

Possibly *haddoni*, *mollis*, *gracilis*, and *albida* are all one species.

## Family 2. DISCOSOMIDAE, sens. strict.

Discosomidae as used by various authors, *pro parte*.

Used here in the sense taken by Carlgren, 1900, p. 58.

Including Phialactidae, Fowler, 1889.

Rhodaetidae, Andres, as used by Haddon, 1898, p. 476, *pro parte*.

Size variable. Living singly or in patches. With one or more mouths. Sphincter absent or weak diffuse. Tentacles simple or dendritic (see Part II, Text-fig. 14, B. c) or somewhat capitate or curious and urn-like, or reduced to warts (see Part II, Text-fig. 3), or to little or nothing, so that they do not show above the surface of the disc at all; more than one sort may occur in the same species, and more than one may communicate with endocoels and exocoels or with endocoels only, there being often radial rows. Presence of ectodermal muscle in body-wall doubtful.

Genera: *Discosoma*, *Paradiscosoma*, *Ricordea*,  
*Orinia*, *Rhodactis*, *Actinotryx*.

**DISCOSOMA**, Leuck., 1828.

Discosomidae with tentacles all of one sort, not branched, not knobbed, may be swollen towards the tips: short, usually wart-like, sometimes reduced or even vanished, so that only traces of them remain as endodermal evaginations in the mesogloea of the disc. Margin of body straight or more or less notched or irregular. Tentacles in radial rows on at least some endocoels, sometimes on exocoels too. Sphincter absent or weak diffuse.

Species:

*D. nummiforme*, Leuck., 1828, p. 3. (See Simon, 1892, and Carlgrén, 1900, p. 62.)

*D. Yuma*, Carlgr., 1900, p. 63.

*D. Unguja*, Carlgr., 1900, p. 64.

And probably others.

I do not feel clear that all the genera that follow are really distinct from *Discosoma*, but am listing them in full. Taking the family as a whole, the two clearest genera are *Discosoma* and *Actinotryx*. Beyond this there is less certainty. *Rhodactis* is probably distinct but is little known. *Ricordea* and *Paradiscosoma* seem doubtfully distinct from *Discosoma*. Even *Orinia* might be only a curious state of *Discosoma*, but is more likely to be distinct than the others: even in *Paradiscosoma* one sometimes sees the tentacles collapse on themselves so that they form little double-walled cups, and it would not take much to make this into *Orinia*; and McMurrich says some of the more peripheral of them are tuberculiform and not crateriform. If there is a naked zone between the marginal and discal sets, however, that will clinch the distinction. There are other genera and species which have been referred at one time and another to this family, before it was properly understood, but these have been cast out as time went on, and are in this paper referred to their new positions, e. g. *Stoichactidae*.

**PARADISCOSOMA**, Carlgr., 1900, p. 60. (n. nom. for *Isaura*.)

Discosomidae with margin of disc thrown into small lobes. Otherwise like *Discosoma*. (See Part II, Text-figs. 3, 6, B, 5.)

## Species :

*P. neglecta*, D. and M., 1860, p. 51. (*Isaura neglecta*, D. and M.) (See Carlgren, 1900, p. 60, and Pax, 1910, p. 214.)

A vertical section of a species of *Paradiscosoma* is given in Part II, Text-fig. 3.

*RICORDEA*, D. and M., 1860. (See Duerden, 1898, p. 635, &c.)

Discosomidae which often live aggregated together in patches. The majority of individuals have more than one mouth, there may be up to seven or so, the disc being consequently sinuous in outline. Sometimes individuals are found connected by a basal membrane. No sphincter, though the animal is retractile. Tentacles short and may be somewhat capitate or rounded at the tip, in radial rows on at least some endocoels. Stems of tentacles may be glandular, their tips nematocystic.

## Species :

*R. florida*, D. and M., 1860, p. 42. (See Duerden, 1900, p. 156; Pax, 1910, p. 219; McMurrich, 1889, 'Journ. Morph.')

*ORINIA*, D. and M., 1860.

Discosomidae with tentacular, simple structures in the periphery of the disc. Inner part of the disc provided with characteristic large urn-like outgrowths. Between the simple tentacles and the urns a tentacle-free area. (See Carlgren, 1900, p. 60.)

## Species :

*O. torpida*, D. and M., 1860. (See Carlgren, 1900, p. 60, and McMurrich, 1905.)

*RHODACTIS*, M. Edw. and H., 1851.

? *Phialactis*, Fowler, 1889.

Discosomidae with tentacles of two sorts, simple ones round the mouth and the edge of the disc, branched ones in the middle, which may arise from pits in the disc; the two sorts not gathered up into sharply-separated zones, and no naked area between marginals and discals. Tentacles may be somewhat capitate in certain states. The animals may live massed together in patches.

## Species :

*R. rhodostoma*, Ehr., 1834.

*R. howesii*, Saville Kent, 1893, p. 150. (See Haddon, 1898, p. 478.)

? *R. neglecta*, Fowler, 1889, p. 148. (See Carlgren, 1900, p. 59-61, &c.)

And perhaps others.

ACTINOTRYX, D. and M., 1860, p. 321. (See Duerden, 1898, p. 635, &c.)

Discosomidae which may occur in scores together, crowded so as to form a carpet, and some individuals have two or more mouths. More or less retractile. There are simple or nearly simple tentacles or tentaculiform outgrowths connected with the margin; within these is a well-marked clear zone, then the main part of the disc has dendrites, some at least in radial rows. Sphincter absent or weak diffuse. (For details of an *Actinotryx* see Part II, Text-figs. 14, B and C, 4, D, and 6, A.)

Species:

*A. sancti-thomae*. D. and M., 1860, p. 45. (See Duerden, 1900, p. 148; McMurrich, 1889, 'Journ. Morph.')

*A. bryoides*. H. and S., 1893, p. 121; Haddon, 1898, p. 479.

And probably others.

## 2. APPENDIX.

There are some anemones recently described by Professor Gravier, whose papers I did not know about, unfortunately, when Part I of this paper was written, and which should be mentioned now. I am at the same time giving a few further details which seem worthy of note about some of Verrill's genera which can hardly be finally allocated yet, but are interesting as showing the direction which some future work should take to clear them up. I regret that by a mischance I overlooked the genus *Euphelia* of Pax before, and that also is included here, together with a few other points.

(i) Professor Gravier's forms.

Professor Gravier has established five new genera and some new species, as follows:

1. *Nectactis* (1918, p. 18). *N. singularis*, 1918, p. 18.

This has the form of a disc thicker in the middle than at the edge, where the capitate tentacles are, the lower surface of it representing the column and having a little pit-like base in its middle. Smooth wall and no sphincter. A good many mesenteries with indiscernible museles.

It is very difficult to even suggest a position for this form in classification. Gravier suggests *Minyadidae*, but it would not do for that family as understood here. If there were disc-tentacles one might suggest *Corallimorphidae*, and possibly that would be best even without them—but more details are needed.

2. *Thoracactis* (1918, p. 12). *T. topsenti*, 1918, p. 12.

A small form living on the surface of a sponge. It is disc shaped, incrusting, the foreign bodies even getting embedded in the mesogloea. Sphincter mesogloecal, seemingly double. No acontia or cinclides. Weak mesenterial musculature.

Gravier believes that the gonads develop from the endoderm of the body-wall. There is not much guide, but the form may be a tiny Paractid or even, possibly, a Zoanthid?

3. *Telmatactis* (1916, p. 236). *T. valle-flori*, 1916, p. 236.

This seems to me to be probably identical with *Phellia*, in which case the species becomes *Phellia valle-flori*.

4. *Sicyopus* (1918, p. 21). *S. commensalis*, 1918, p. 21.

This lives on a Holothurian, in a hollow of its skin near the mouth. It has the form of a thick disc, strong mesogloecal sphincter, no acontia or cinclides, diffuse retractors, all mesenteries fertile. It seems like a small Paractid of uncertain affinities.

5. *Gliactis* (1918, p. 7). *G. crassa*, 1918, p. 7.

Here the base envelops *Acanella*. There are no verrucac, the column wall is thick. Good mesogloecal sphincter. Apparently twenty pairs of perfect mesenteries, probably diffuse retractors. If there are no acontia or cinclides this seems eligible for one of the Paractid genera, and probably does not merit generic distinction.

I have not suggested very definitely about the above forms, but they are not all very fully studied as yet, and the time has not come to decide for or against them; but they will probably fit into known families.

In addition Professor Gravier has described new species in old genera as follows:

1. *Paractis flava* (1918, p. 4). Either a *Paractis* in the strict sense, or belonging to a neighbouring genus.

2. *Paractis vestita* (1918, p. 5) may have some sort of investment on the column, and seems to have only six pairs of perfect mesenteries, no acontia and cinclides, mesogloecal sphincter; in which case it is no *Paractis*, but an *Actinosephyd* near *Paranthus*, perhaps eligible for that genus.

3. *Actinernus verrilli* (1918, p. 6) is not an *Actinernus* (= *Porponia*), since it has a mesogloecal sphincter and is apparently

not endocoelactous. Nor is it an *Actinoseyphia* since it has numerous perfect mesenteries. It must therefore belong to *Catadiomene* or *Polysiphonia*, as it has basal swellings to the tentacles; and from the description I gather that it is more likely to be *Polysiphonia* than the other, but further details are needed for decision.

4. *Sagartia sociabilis* (1918, p. 10). No cinclides. Seemingly six pairs of perfect mesenteries with weak musculature. If it has acontia it must be a *Sagartiomorphe*—certainly not a *Sagartia*.

5. *S. sobolescens* (1918, p. 11) is perhaps a *Sagartiomorphe* also.

6. *Chitonanthus incubans* (1918, p. 11) is very exceptional as a *Chondractinian* in having the three oldest cycles of mesenteries fertile. Since *Chitonanthus* is only a synonym of *Hormathia*, the right name for the species is *Hormathia incubans*.

7. *Chitonanthus indutus* (1918, p. 12) should, similarly, be *Hormathia induta*.

8. *Chitonanthus abyssorum* (1918, p. 13) seems to be either *Hormathia abyssorum* or an *Actinauge*.

9. *Hormathia elongata* (1918, p. 14) seems correctly named.

10. *Hormathia? muscosa* (1918, p. 15) has apparently no acontia, so cannot be a *Chondractiniid*. It has numerous perfect mesenteries and a mesogloal sphincter, which bring it to *Paraactidae*; its circumscribed retractors and some of its externals suggest *Hormosoma* or *Tealidium* or *Pseudoparactis*, but this is uncertain, and it may need a new genus.

11. *Stephanaectis impedita* (1918, p. 16) becomes *Stephanauge impedita*, since Verrill has shown that the name *Stephanaectis* was pre-occupied.

12. *Stephanaectis inornata* (1918, p. 17) becomes *Stephanauge inornata*.

13. *Corallimorphus ingens* (1918, p. 23); see this paper, p. 302.

14. *Anemonia insessa* (1918, p. 3) is more likely a *Gyrostoma*.

## (ii) Details from Verrill.

1. Verrill (1899) has explained that the name *Stephanaectis* is pre-occupied (1868), and renamed Hertwig's genus *Stephanauge*. There are now recorded, as forms with mesogloal sphincter, six pairs of perfect mesenteries (not macrocnemes), no acontia, and a very few (up to about eight) cinclides, *Stephanauge impedita*, Grav., *S. inornata*, Grav., *S. abyssicola*, Hertw. (= *Actinauge nexilis*, Verr.), *S. tuberculata*, Hertw., &c. In Part I of this



paper I mentioned (p. 487) this genus without being very definite about it. I do not think a final decision can be made even now, but if these cinclidal non-acontiated forms are established they will probably need a family Stephanaugidae, one of the further combinations foreshadowed in Part I. From the fewness of their cinclides, and from their general characters one imagines the cinclides to be vestiges not to last much longer, and probably the forms are descendants of Metridiid ancestors which have lost the acontia before all the cinclides; but it is not even certain yet that there are not really rudimentary acontia, easily overlooked, present, in which case the forms are actually queer Metridiidae on the way to forming Chondractiniid or Actinoscyphiid or other stages. *S. tuberculata*, at least, has basal mesogloal swellings to some of the tentacles. If the others have not they need separation, and the whole genus and its relations need careful revision. The related (?) *Amphianthus* seems to be an Actinoscyphiid, so far as it is at present known.

2. *Synanthus*, Verr., is probably *Paranthus*.

3. *Ammophilactis*, Verr., 1899, p. 213.

Body may be long, with small base, divided into smooth scapus with a collar in which is the mesogloal sphincter, and capitulum with suckers which can attach grains of sand. Tentacles in more than two cycles in the adult. Numerous perfect mesenteries. Strong apparently diffuse retractors. Older mesenteries fertile.

*A. rapiformis*, Les., 1817, p. 171. (See Verrill, 1899, p. 213.)

This seems clearly a Paraetid, differing from *Pseudoparactis* in its single sphincter and suckers.

4. *Archactis*, Verr., seems very near or identical with *Antholoba*.

5. *Raphactis*, Verr., 1899, p. 144.

Definite base, broadly expanded or stem-clasping. Column with a capitulum which may be more or less ridged, and a scapus which is often ridged at the top, where the mesogloal sphincter lies, and may also be tuberculate. Twelve or more pairs of perfect (and at least mostly) fertile mesenteries, others may be fertile too. Diffuse retractors. Tentacles in more than two cycles in the adult.

*R. nitida*, Verr., 1899, p. 144.

*R. caribaea*, Verr., 1899, p. 205.

This may be the same as *Pseudoparactis*, in which case it takes priority. But it seems distinguished by its single sphincter, and distinct from *Ammophilactis* in its lack of suckers.

6. Verrill says *Stomphia* may have fertile perfect mesenteries, perfect mesenteries 16-24 pairs in large specimens.

7. *Antiparactis*, Verr., is probably a synonym of *Paranthus*.

(iii) Other details.

1. *Euphellia*, Pax, 1908, p. 475.

Diadumenidae with definite base. Wall may be wrinkled. No papillae or suckers. Distinctly divided into scapus and capitulum, the scapus with an easily-shed investment. No acrorhagi or fosse. Long strong mesogloal sphincter. Six pairs of macrocnemes. Acontia not specially strong. There are cinclides in longitudinal rows.

*E. cinclidifera*, Pax, 1908, p. 475.

The definition of Diadumenidae will need slight alteration of detail to admit this form. It seems to be, if it really has cinclides, a link between Diadumenidae and Phelliidae, a Diadumenid on the way to becoming a Phellia.

2. Pax describes a *Paraphellia polyptycha* (1908, p. 493), which may be a *Paraphellia* or possibly a *Sagartiomorphe*.

3. *Andvakia* is of quite uncertain standing and more needs to be known of it.

4. *Allantaetis* seems to be the same as *Sagartiomorphe*, and if this is so the name has priority.

5. *Octineon*, Moseley, M. S. (See Fowler, 'Quart. Journ. Micr. Sci.', vol. 35, 1894, p. 461.) (= *Ammodiscus*, Carp., 1871, p. 159.)

The body has the form of a thin disc a little raised in the middle, and encrusted with sand and other things which may get into the mesogloea. Sphincter seemingly mesogloal. Probably twelve tentacles. Twelve larger primary and perfect mesenteries, but only the eight Edwardsia mesenteries provided with true retractors. Very few of the mesenteries beyond the twelve primaries perfect, and these are thin, with no gonad or filament and little muscle. Of the two couples of primaries over and above the Edwardsia eight, one couple has a modified kind of muscula-

ture and no filaments, and the other couple has no gonad, filament, or well-developed muscle. The eight *Edwardisia* mesenteries have huge circumscribed retractors of curious form, which seem to be tending to shift off the mesenteries; they also have gonads and filaments.

*O. lindahli*, Carp. 1871, p. 159. (See Fowler, 1894, p. 461.)

This genus seems to be eligible for *Marsupiferidae*. As far as I can understand the account of it, I take it that it has a mesogloéal sphincter, and the rest fits in fairly well. It is a queer form with a reduced number of macrocnemes: cf. *Decapheilia* and some *Halcampas*.

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#### APPENDIX TO LIST OF LITERATURE.

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#### 4. INDEX TO GENERA DEALT WITH IN PARTS II AND III.

Numbers printed in heavy type refer to the pages on which the generic definitions are to be found. Words printed in italics are synonyms or genera of uncertain position.

- Acremodactyla*, III, 294  
 Actinauge, III, 308  
 Actinera, II, 548 ; III, 295, **296-7**  
 Actinermis, II, 523, 545 ; III, **259**, 307-8  
 Actinia, II, 501, 524, 527, 531, 546 ; III, **266-7**, 282, 293  
*Actinoides*, II, 524, 526-8 ; III, 270-71  
 Actinodendron, II, 547, 562 ; III, **294-5**  
 Actinoporus, II, 534, 547 ; III, 291, **293**  
 Actinoscyphia, II, 560 ; III, 259, 308  
*Actinostella*, III, 283-4  
 Actinostephanus, II, 547 ; III, **294**  
 Actinotryx, II, 511-12, 515, 535, 544 ; III, 304, **306**  
*Aegeon*, III, 270  
*Aegir*, III, 251, 253  
 Aiptasia, II, 504  
 Alicia, II, 530-31, 546 ; III, **279-80**  
*Allantactis*, III, 310  
*Ammodiscus*, III, 310  
*Ammophilactis*, III, 309-10  
*Amphianthus*, III, 309  
 Andresia, II, 518, 521, 545 ; III, 255, **264-5**  
*Andrakia*, III, 310  
 Anemonia, II, 501, 524, 527-8, 531, 546 ; III, 266, **267-8**, 270, 278, 308  
*Anthca*, III, 267  
*Anthcomorphe*, III, 278  
 Anthopsis, II, 535-6, 548 ; III, 265, 297-8, **299**, 300  
 Antholoba, III, 309  
*Anthopleura*, II, 526-8 ; III, 270-71, 286  
*Antiparactis*, III, 310  
 Archactis, III, 309  
 Artemidactis, II, 515, 557  
*Asteractis*, III, 283-4  
*Aulactinia*, III, 270-72  
 Aureliania, II, 512, 534-5, 547 ; III, 274, **291-3**  
*Bicidium*, III, 257  
 Bolocera, II, 506-8, 526-7, 531, 546 ; III, 266, 272-3, **275-7**, 287  
 Boloceroïdes, II, 505-8, 526, 531, 540, 545, 564 ; III, 250, 262, **263**  
 Boloceroïdes, II, 531, 546 ; III, 266, **276**  
 Bunodactis, II, 500-01, 515, 526-9, 531, 546 ; III, 266, 269, **270-74**, 276, 278-9, 284-6  
*Bunodella*, III, 270

- Bunodeopsis*, II, 506-7, 526, 530-31, 546; III, 281-2, **286-7**  
*Bunodes*, II, 526; III, 270-71, 285  
*Bunodosoma*, III, 283, 285-6  
  
*Capnea*, III, 292  
*Carlgenia*, II, 523, 545, 550, 560; III, 257, **258**  
*Caryophyllia*, II, 511  
*Catadiomene*, II, 554, 560; III, 308  
*Cereactis*, III, 268  
*Chalmersia*, III, 302  
*Charisza*, III, 262  
*Chitonactis*, II, 530  
*Chitonanthus*, II, 530; III, 308  
*Chondractinia*, II, 530  
*Cladactis*, III, 279  
*Comactis*, III, 267, 278  
*Condylactis*, II, 524, 527-8, 531, 546; III, 266, **268**, 269-70, 277-8  
*Condylanthus*, II, 524, 531, 545; III, **262**  
*Corallimorphus*, II, 515, 535, 543; III, **301-2**, 308  
*Corynactis*, II, 543; III, 301, **302-3**  
*Cradactis*, II, 530-31, 546; III, 281-2, **284-5**  
*Crambactis*, III, 290  
*Cribrina*, III, 270-71  
*Cryptodendron*, II, 502, 512, 534, 548; III, 295, **296**  
*Cystiactis*, II, 530-31, 546; III, 281-2, **286**  
  
*Dactylanthus*, II, 508-9, 543; III, 249, **250**  
*Decaphellia*, II, 520; III, 311  
*Diplactis*, III, 266  
*Discosoma*, II, 511, 544; III, **304**  
*Discosomoides*, III, 298  
*Dofleinia*, II, 531, 546; III, 266, **277**  
  
*Edwardsia*, II, 550, 557; III, 248  
*Eloactis*, II, 518, 520-21, 544, 560; III, 254, **255**  
*Endocoelectis*, III, 257  
*Eoactinia*, II, 532, 563, 565  
*Eosagartia*, II, 532, 557, 563, 565  
*Epiactis*, II, 512, 526, 529, 531, 546; III, 266, **274-5**, 278, 292  
  
*Epigonactis*, III, 274  
*Eucladactis*, III, 285  
*Euphellia*, III, 306, **310**  
*Evactis*, III, 270  
  
*Fenja*, III, 251, 253  
  
*Gliactis*, III, 307  
*Glyphoperidium*, III, 274, 278  
*Glyphostylum*, II, 531, 546; III, 266, **277-8**  
*Goactinia*, II, 504-5, 543, 550, 554-6; III, 247, **248**  
*Gyraactis*, III, 278-9  
*Gyrostoma*, II, 524, 531, 546; III, 263-4, 266, **267-8**, 276, 278, 308  
  
*Halcampa*, II, 499, 504, 515, 518-20, 544, 550, 554-6; III, 251, **252-3**, 257, 290, 311  
*Halcampactis*, II, 517; III, 265  
*Halcampella*, III, 251, 253  
*Halcampoides*, II, 518-20, 532, 544; III, 251-2, **253**  
*Halcampomorpha*, III, 253  
*Halcurias*, II, 523, 545, 560; III, **257-8**  
*Halianthella*, III, 251  
*Halianthus*, III, 251  
*Haloclava*, II, 518, 520-21, 544; III, 253-4, **255-6**  
*Harenactis*, II, 501, 518, 520-21, 544, 560; III, 254, **256**  
*Helianthopsis*, III, 298-9  
*Heteranthus*, II, 548; III, **290**  
*Heteroductyla*, III, 295-6  
*Homostichanthus*, II, 547; III, **291**  
*Hoplophoria*, III, 280, 287-8  
*Hormathia*, II, 530; III, 266, 279, 308  
*Hormosoma*, III, 308  
  
*Ilyanthopsis*, III, 260, 268, 270, 278  
*Ilyanthus*, II, 518, 520-21, 544; III, 254, **255**, 264  
*Isactinernus*, II, 545; III, 259, **260**  
*Isactinia*, III, 267  
*Isaura*, III, 304-5  
*Isocorallion*, II, 543; III, 301, **302**

- Isotealia*, II, 526, 531, 546; III, 266, 275, 292  
*Ixalactis*, II, 531, 546; III, 266, 277  
*Kylindrosactis*, III, 279  
*Lebrunia*, II, 530-31, 546; III, 280-82, 287, 288  
*Lciotcalia*, III, 274, 291-3  
*Læpsiceras*, II, 531, 546; III, 266, 276  
*Liponema*, III, 275-6  
*Lophactis*, III, 283-4  
*Macrodactyla*, II, 524, 531, 545; III, 263, 265, 272  
*Madoniactis*, III, 272, 279  
*Megalactis*, II, 535, 547; III, 294, 295  
*Metridium*, III, 279  
*Minyas*, II, 501; III, 288  
*Myonanthus*, II, 506-7, 524, 531, 545; III, 263, 265  
*Myriactis*, III, 278  
*Nautactis*, II, 533  
*Nectactis*, III, 306  
*Nevadne*, II, 531, 545; III, 263, 264  
*Octineon*, III, 310, 311  
*Ophiodiscus*, II, 530  
*Oractis*, II, 504, 505; III, 248, 249  
*Orinia*, II, 511, 544; III, 304, 305  
*Oulactis*, III, 283-4  
*Paraactis*, III, 307  
*Paradiscosoma*, II, 509, 511, 514-15, 544, 557; III, 304-5  
*Paranemonia*, III, 267-18  
*Parantheopsis*, II, 531, 546; III, 266, 269, 270  
*Paranthus*, III, 307, 309-10  
*Paraphellia*, III, 310  
*Parazoanthus*, II, 550  
*Peachia*, II, 501, 517-18, 520, 544, 552, 560, 574; III, 251, 254, 256-7  
*Pentaactinia*, II, 518-20, 544; III, 251, 254  
*Phellia*, III, 307, 310  
*Phialactis*, III, 305  
*Philomedusa*, III, 257  
*Phylctenactis*, III, 286  
*Phyllactis*, II, 530-31, 546; III, 281-2, 283, 284-5  
*Phyllodiscus*, II, 502, 530-31, 534, 546, 561; III, 279, 280-81, 285  
*Phymactis*, II, 525, 530-31, 546, 554; III, 281-2, 285-6  
*Phymanthus*, II, 501, 512, 535, 547; III, 289-90  
*Polyopsis*, III, 254  
*Polysiphonia*, III, 259, 308  
*Polystomidium*, III, 278  
*Porponia*, III, 259, 307  
*Protanthea*, II, 504-5, 543, 555; III, 247, 248  
*Pseudoparactis*, III, 308-10  
*Pseudophellia*, II, 531, 546; III, 266, 275  
*Ptychodactis*, II, 508, 543; III, 249  
*Radianthus*, II, 548; III, 278, 297-8, 299  
*Ragactis*, III, 277  
*Raphactis*, III, 309-10  
*Rhodactinia*, III, 272-3  
*Rhodactis*, II, 511, 544; III, 304, 305  
*Ricordea*, II, 511, 544; III, 304, 305  
*Rivetia*, III, 285-6  
*Saccuctis*, III, 284  
*Sagartia*, III, 271, 308  
*Sagartiomorphus*, III, 308, 310  
*Scytophorus*, II, 518-20, 544; III, 251, 253, 254  
*Sicyopus*, III, 307  
*Siphonactinia*, III, 256  
*Stephanactis*, III, 308-9  
*Stephanuuge*, III, 308-9  
*Stichodactis*, III, 298-9  
*Stichophora*, II, 533, 546; III, 288  
*Stoichactis*, II, 548; III, 297, 298-9  
*Stomphia*, III, 279, 310  
*Synactinermus*, II, 545; III, 259  
*Synanthus*, III, 309  
*Synhalcurias*, II, 545; III, 259, 260, 278

- Tealia*, II, 501, 518, 526, 528-9, 531, 546, 554 ; III, 266, **272-4**, 276, 279  
*Tealidium*, III, 308  
*Tealiopsis*, III, 279  
*Tclmatactis*, III, 307  
*Thalassianthus*, II, 535, 548, 560 ; III, **295-6**  
*Thaumactis*, II, 530-31, 546 ; III, 281-2, **287**  
*Thelaceros*, III, 289  
*Thoracactis*, III, 307  
*Triactis*, III, 281  
*Urticina*, III, 271, 273  
*Viatrix*, III, 287